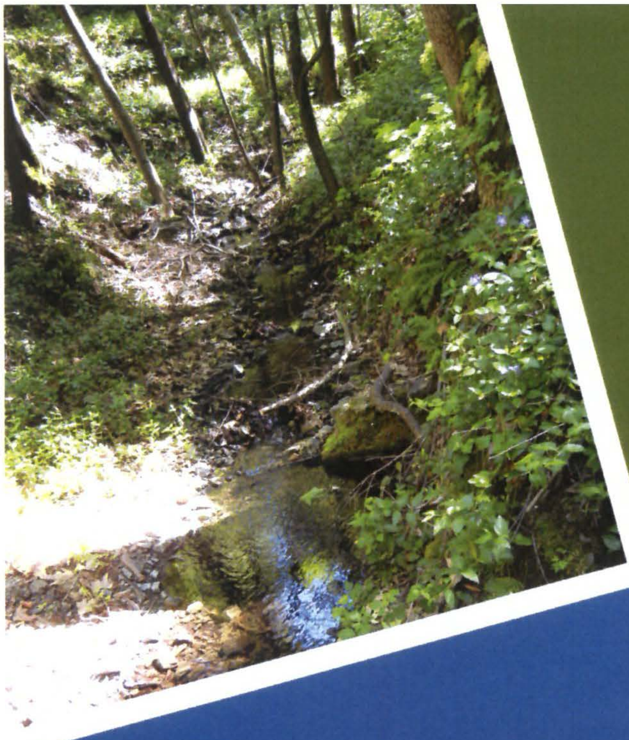
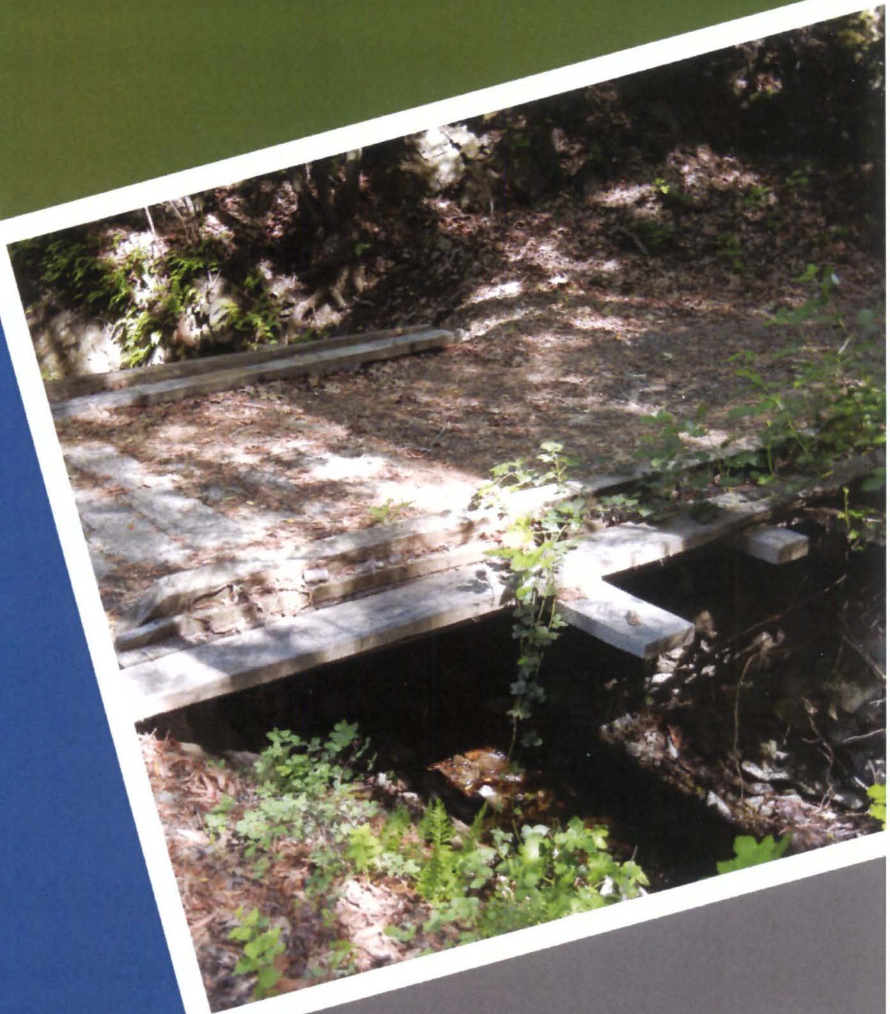
Meeting Date: 6/9/2015

A complete copy of this document can be viewed on line at:
http://www.valleywater.org/PubicReviewDocuments.aspx

Or a copy can be obtained at the Clerk of the Board's Office.





Hendrys Creek Restoration Project

Initial Study/
Mitigated Negative Declaration

March 2015

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REGIONAL
OPEN
SPACE

PREPARED FOR:
Midpeninsula Regional
Open Space District
330 Distel Circle
Los Altos, CA 94022

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Hendrys Creek Restoration Project

Initial Study/Mitigated Negative Declaration

PREPARED FOR

Midpeninsula Regional Open Space District
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March 2015

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ACRONYMS AND ABBREVIATIONS

ADI ASR	Area of Direct Impact
BAAQMD	Archaeological Survey Report
BMP	Bay Area Air Quality Management District
CAL FIRE	best management practice
Caltrans	California Department of Forestry and Fire Protection
CCR	California Department of Transportation
CEQA	California Code of Regulations
CO_2	California Environmental Quality Act
CRHR	carbon dioxide
DFG	California Register of Historical Resources
DGC	California Department of Fish and Game
DTSC	Diablo Green Consulting
EIR	California Department of Toxic Substances Control
ESA	Environmental Impact Report
FMMP	Environmental Site Assessment
GHGs	Farmland Mapping and Monitoring Program
IPCC	greenhouse gases
IPM	Intergovernmental Panel on Climate Change
IS/Proposed MND	Integrated Pest Management
LTMP	Initial Study/Proposed Mitigated Negative Declaration
MROSD	Long-term Management Plan
MT CO_2e/yr	Midpeninsula Regional Open Space District
NO_x	metric tons of CO_2 equivalent per year
NPDES	nitrogen oxides
OHP	National Pollutant Discharge Elimination System
PM_{10}	Office of Historic Preservation
$PM_{2.5}$	particulate matter, exhaust
POST	particulate matter, exhaust
PRC	Peninsula Open Space Trust
Preserve	Public Resources Code
ROG	Sierra Azul Open Space Preserve
	reactive organic gases

SB	Senate Bill
SCCFD	Santa Clara County Fire Department
SCWJD	Santa Clara Valley Water District
SMP	2002 Multi-Year Stream Maintenance Program
VMT	vehicle miles traveled

1 INTRODUCTION

1.1 INTRODUCTION AND REGULATORY GUIDANCE

This Initial Study/Proposed Mitigated Negative Declaration (IS/Proposed MND) has been prepared by the Midpeninsula Regional Open Space District (MROSD) to evaluate potential environmental effects resulting from implementation of the Hendrys Creek Long-term Management Plan (LTMP), including rehabilitation of road crossings and upland areas. The 117-acre Hendrys Creek Property (project site) would be purchased by MROSD as an addition to the Sierra Azul Open Space Preserve (Preserve). The proposed project would provide compensatory mitigation for wetland impacts associated with the Santa Clara Valley Water District's (SCVWD) 2002 Multi-Year Stream Maintenance Program (SMP). A perpetual Conservation Easement would be held by the SCVWD describing a commitment to specifically preserve and protect the conservation values of the project site while also allowing opportunities for ecologically sensitive public enjoyment of the property. The goal of the mitigation is to preserve, protect and improve the ecological condition of selected local streams and their associated watersheds. The project site includes stream, riparian and upland habitat and is strategically located within a large preserved landscape and watershed, which would enable the protection of ecological functions, values, and processes that are important for the regional ecosystem. The permitting agencies accepting compensatory mitigation include the San Francisco District of the U.S. Army Corps of Engineers, the California Department of Fish and Wildlife, and the San Francisco Regional Water Quality Control Board. Ascent Environmental, Inc. has been retained by MROSD to prepare this analysis on their behalf.

This document has been prepared in accordance with the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.) and the State CEQA Guidelines (California Code of Regulations Section 15000 et seq.). An initial study is prepared by a lead agency to determine if a project may have a significant effect on the environment (State CEQA Guidelines Section 15063[a]), and thus to determine the appropriate environmental document. In accordance with State CEQA Guidelines Section 15070, a "public agency shall prepare...a proposed negative declaration or mitigated negative declaration...when: (a) The Initial Study shows that there is no substantial evidence...that the project may have a significant impact on the environment, or (b) The Initial Study identifies potentially significant effects but revisions to the project plans or proposal are agreed to by the applicant and such revisions would reduce potentially significant effects to a less-than-significant level." In this circumstance, the lead agency prepares a written statement describing its reasons for concluding that the proposed project would not have a significant effect on the environment and, therefore, does not require the preparation of an Environmental Impact Report (EIR). By contrast, an EIR is required when the project may have a significant environmental impact that cannot clearly be reduced to a less-than-significant effect by adoption of mitigation or by revisions in the project design.

1.2 WHY THIS DOCUMENT?

As described in the environmental checklist (Chapter 3), the proposed project would not result in any unmitigated significant environmental impacts. Therefore, an IS/Proposed MND is the appropriate document for compliance with the requirements of CEQA. This IS/Proposed MND conforms to these requirements and to the content requirements of State CEQA Guidelines Section 15071.

Under CEQA, the lead agency is the public agency with primary responsibility over approval of the proposed project. MROSD is the CEQA lead agency because they are responsible for purchasing the project site and implementing the proposed LTMP. The purpose of this document is to present to decision-makers and the public information about the environmental consequences of implementing the proposed project. This disclosure document is being made available to the public for review and comment. This IS/Proposed MND will be available for a 30-day public review period from March 20, 2015 to April 20, 2015.

Supporting documentation referenced in this document is available for review at:

Midpeninsula Regional Open Space District
330 Distel Circle
Los Altos, CA 94022
Phone: (650) 691-1200

Comments should be addressed to:

Meredith Manning, Senior Planner
Midpeninsula Regional Open Space District
330 Distel Circle
Los Altos, CA 94022
Phone: (650) 691-1200
Fax: (650) 691-0485

E-mail comments may be addressed to: mmanning@openspace.org

If you have questions regarding the IS/Proposed MND, please call Meredith Manning at (650) 691-1200. If you wish to send written comments (including via e-mail), they must be postmarked by April 20, 2015.

After comments are received from the public and reviewing agencies, MROSD may (1) adopt the MND and approve the proposed project; (2) undertake additional environmental studies; or (3) abandon the project. If the project is approved and funded, MROSD may proceed with the project.

1.3 SUMMARY OF FINDINGS

Chapter 3 of this document contains the analysis and discussion of potential environmental impacts of the proposed project.

Based on the issues evaluated in that chapter, it was determined that the proposed project would have either no impact or a less-than-significant impact related to all but three of the issue areas identified in the Environmental Checklist, included as Appendix G of the State CEQA Guidelines. These include the following issue areas:

- aesthetics
- agricultural resources
- air quality
- geology and soils
- greenhouse gas emissions
- hazards and hazardous materials
- hydrology and water quality
- land use and planning
- mineral resources
- population and housing
- public services
- recreation
- noise
- transportation/traffic
- utilities and service systems
- mandatory findings of significance

Potentially significant impacts were identified for biological resources, cultural resources, and hazards and hazardous materials; however, mitigation measures included in the IS/Proposed MND would reduce all impacts to a less-than-significant level.

1.4 ENVIRONMENTAL PERMITS

In addition to MROSD approval, the project may require a Section 404 Permit from the U.S. Army Corps of Engineers, compliance with California Department of Fish and Game Code Sections 1602 and 2080.1, Section 401 certification from the San Francisco Regional Water Quality Control Board. As a government agency, the District is exempt from obtaining a grading permit from the County of Santa Clara.

1.5 DOCUMENT ORGANIZATION

This IS/Proposed MND is organized as follows:

Chapter 1: Introduction. This chapter provides an introduction to the environmental review process. It describes the purpose and organization of this document as well as presents a summary of findings.

Chapter 2: Project Description and Background. This chapter describes the purpose of and need for the proposed project, identifies project objectives, and provides a detailed description of the proposed project.

Chapter 3: Environmental Checklist. This chapter presents an analysis of a range of environmental issues identified in the CEQA Environmental Checklist and determines if project actions would result in no impact, a less-than-significant impact, a less-than-significant impact with mitigation incorporated, or a potentially significant impact. If any impacts were determined to be potentially significant, an EIR would be required. For this project, however, none of the impacts were determined to be significant after implementation of mitigation measures.

Chapter 4: References. This chapter lists the references used in preparation of this IS/Proposed MND.

Chapter 5: List of Preparers. This chapter identifies report preparers.

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2 BACKGROUND AND PROJECT DESCRIPTION

2.1 INTRODUCTION

The proposed project would include implementation of a Long-term Management Plan (LTMP) for the Hendrys Creek Property, which would be purchased by Midpeninsula Regional Open Space District (MROSD) and become part of the existing Sierra Azul Open Space Preserve (Preserve). Implementation of the LTMP would include restoration of road/stream crossings across Hendrys Creek and its tributaries and rehabilitation of disturbed upland areas.

2.2 PROJECT BACKGROUND AND NEED

The Hendrys Creek Property is located on 117 acres and is proposed by MROSD for purchase, environmental enhancement, and addition to the adjacent approximately 19,000-acre Preserve. The proposed project would also satisfy a mitigation requirement for another agency, the Santa Clara Valley Water District (SCVWD) by providing compensatory mitigation in perpetuity for wetland impacts associated with SCVWD's 2002 Multi-Year Stream Maintenance Program (SMP), as required by the Final Environmental Impact Report for the Multi-Year SMP (2001, SCH 2000102055). Peninsula Open Space Trust (POST) is the current property owner, and as part of a collaborative agreement between MROSD, SCVWD, and POST, the property would be acquired and placed under permanent ownership by MROSD, with a perpetual conservation easement held by SCVWD. The conservation easement property includes approximately 99 acres of Stream and Watershed Protection Buffers for 8.3 acres of freshwater wetland mitigation credit. Stream and Watershed Protection buffers are described in the SCVWD Stream and Watershed Protection Program Mitigation and Monitoring Plan (see Appendix A). The buffers constitute land preservation areas containing streams and their adjacent watersheds from 50 to 500 feet from the stream centerlines, as defined in the program. Mitigation requirements for the SMP are described in the U.S. Army Corps of Engineers Permit No 22525S (August 7, 2002), San Francisco Bay Regional Water Quality Control Board Waste Discharge Order No. R2-2002-0028 (March 5, 2002), California Department of Fish and Wildlife Lake or Streambed Alteration Agreement No. R3-2001-0119 (July 8, 2002), and Agreement No. 1600-2009-0361-R3 (January 11, 2011).

MROSD's mission is "to acquire and preserve a regional greenbelt of open space land in perpetuity, protect and restore the natural environment, and provide opportunities for ecologically sensitive public enjoyment and education." MROSD currently owns and manages more than 62,000 acres in 26 open space preserves, including the Sierra Azul Open Space Preserve to which the Hendrys Creek Property would be added. All open space preserves are managed by MROSD for low-impact recreational opportunities and the preservation and restoration of natural habitat.

Prior to purchase of the property by POST, the property was privately owned by individuals. Use of the Hendrys Creek Property is believed to have started in the 1930s, and numerous level pads and road networks were created and graded by the previous owner for small home sites, recreational vehicle trailers, and a one-acre golf green. All structures, septic tanks, personal property and debris were removed prior to POST's purchase of the property with the exception of an existing network of roads and driveways, two vehicle bridges, several culverted road/stream crossings, and a pedestrian bridge.

2.2.1 Applicable Planning Documents and Studies

The following planning documents and technical studies, which are referenced throughout this IS/Proposed MND, apply directly or indirectly to the Hendrys Creek property and the proposed project. They are available on MROSD's website, www.openspace.org.

- Resource Management Policy Document. MROSD adopted updated Resource Management Policies in 2011, which define the practices used by MROSD to protect and manage MROSD lands. These policies apply to all MROSD lands, including the entire Preserve.
- Regulations for Use of Midpeninsula Regional Open Space MROSD Lands. MROSD adopted these regulations for use of MROSD lands in 1993, and most recently revised them in 2014. These policies apply to all MROSD lands, including the entire Preserve.
- Integrated Pest Management (IPM) Program. MROSD's IPM program guides the pest management and invasive species control District-wide, including properties leased and managed by MROSD like Hendrys Creek.

2.3 PROJECT LOCATION

The project site is located at 20610 Aldercroft Heights Road in unincorporated Santa Clara County. The project site is east of Lexington Reservoir within the Los Gatos Creek watershed and is located along the northeast side of the Santa Cruz Mountains between Santa Clara Valley and Monterey Bay (See Exhibits 2-1 through 2-3). The project site is accessible from a deeded access road through private property to Aldercroft Heights Road. Surrounding land uses include the Preserve to the north, south, and east, and private property to the west and along its southeastern corner.

2.4 SITE DESCRIPTION

The 117-acre project site is characterized by steep, rugged terrain that ranges from 800 feet to approximately 2,600 feet in elevation. The project site is transversed by Hendrys Creek, which is a year-round spring-fed creek. An unpaved road extends up Hendrys Creek canyon with several short spur roads that served as driveways to former home sites. There are 14 stream crossings (all tributaries to Hendrys Creek) along these roads that have been evaluated for rehabilitation; eight along Hendrys Creek Road and six on other spur roads. The crossings consist of culverts, bridges, and unimproved wet fords; all are either structurally deficient or have high potential to deliver sediment to the aquatic ecosystem.

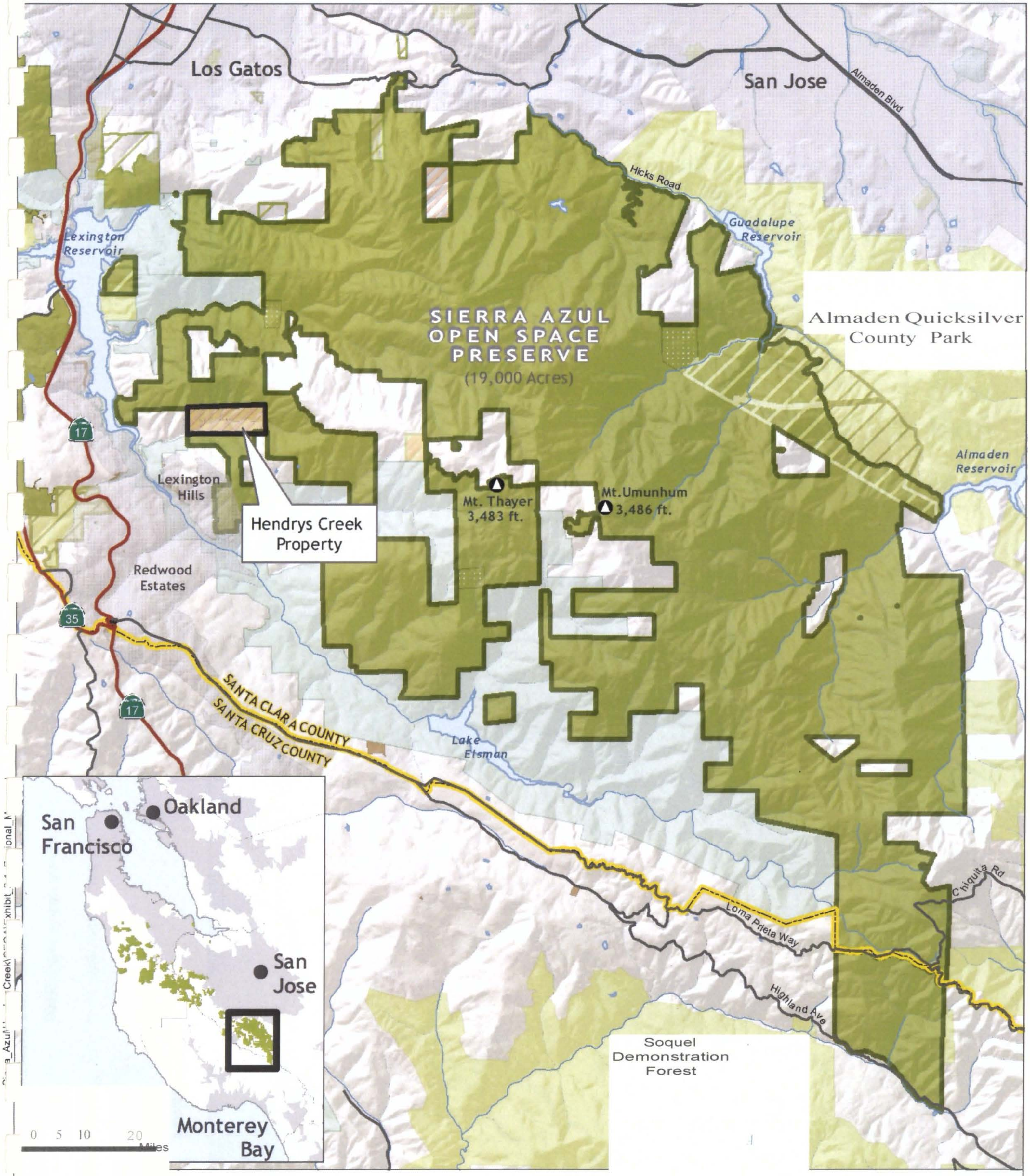

Exhibit 2-1

Regional Location

c:J Project Area

MROSD Preserves

Management Agreement

Land Trust

County Boundary

Watershed Land

Private Property

EIJ Urban Area

Other Protected Open Space Or Park Lands

Non MROSD Conservation or Agricultural Easement

MROSD Conservation or Agricultural Easement

Midpeninsula Regional Open Space District

October 2014

White the District strives to use the best available digital data, this data does not represent a legal survey and is merely a graphic illustration of geographic features.

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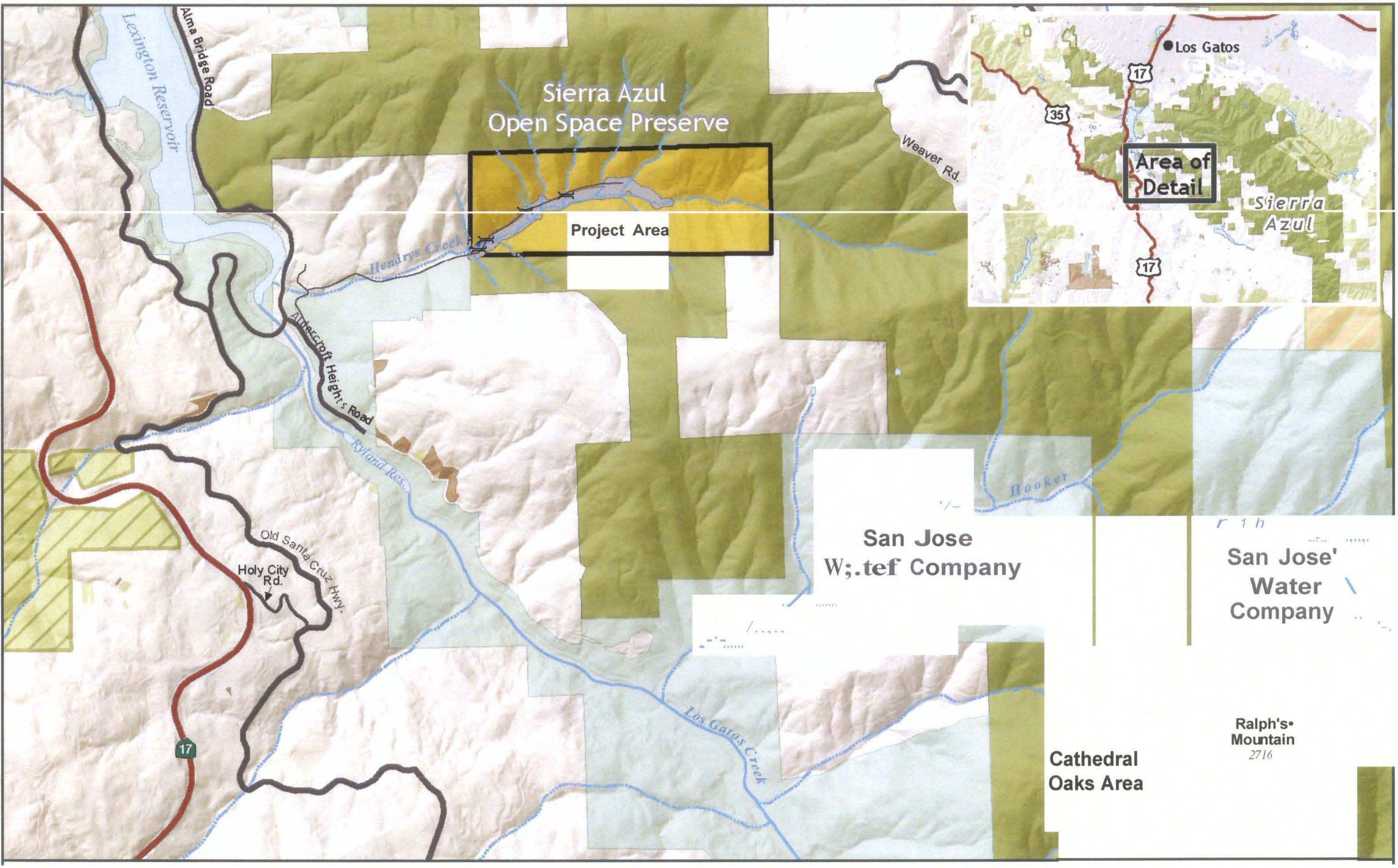

Exhibit 2-2 **Project Location**

▭ Project Area

🟨 Hendrys Creek Property

🟩 MROSD Open Space Preserves

Land Trust

Watershed Land

🟫 Other Public Agency

Other Protected Open Space or Park Lands

MROSD Conservation or Agricultural Easement

Non MROSD Conservation or Agricultural Easement

Private Property

Midpeninsula Regional Open Space District (MROSD)

March, 2015

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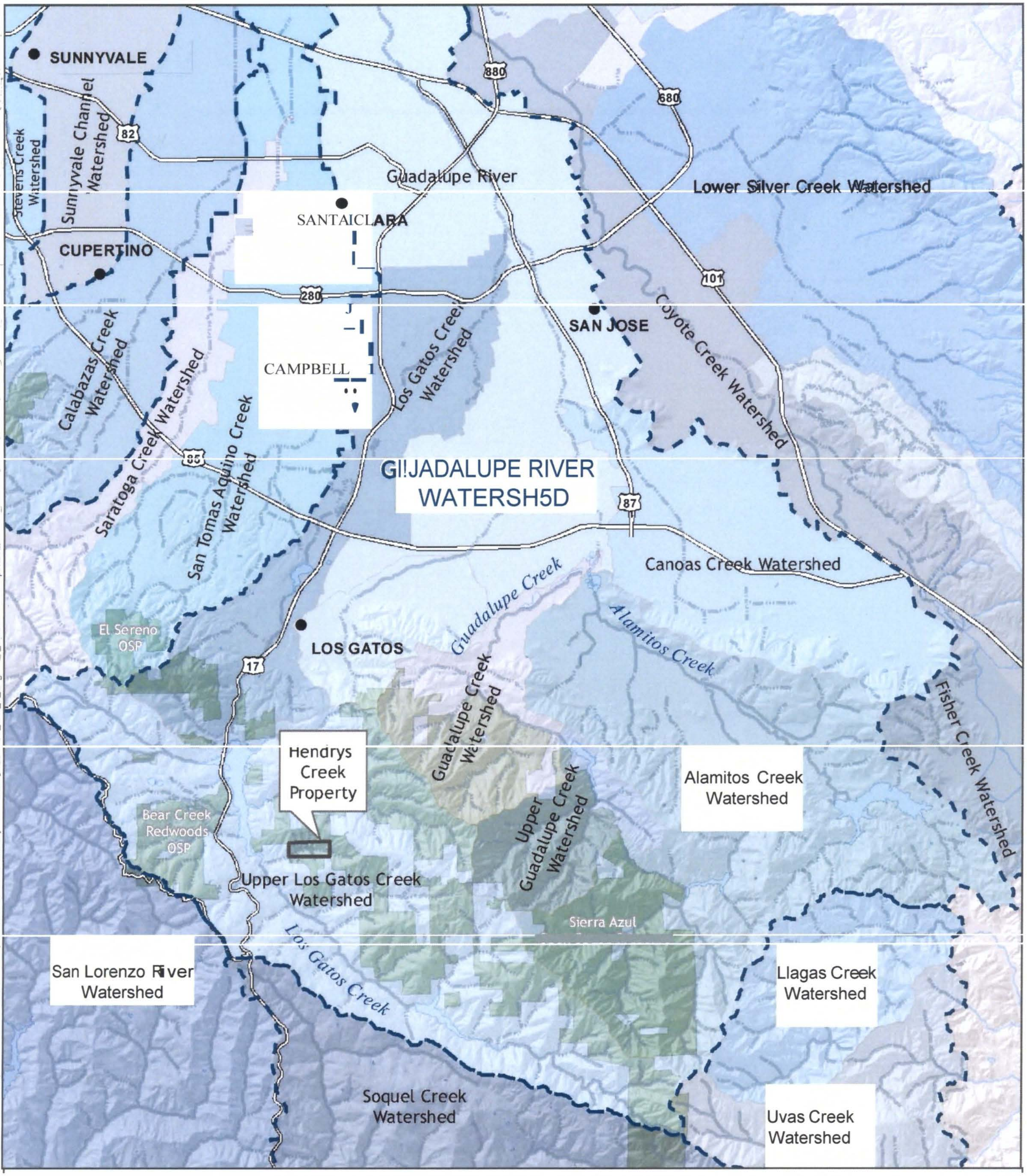

Exhibit 2-3 RegionalWatersheds

Major Watersheds

Lake or Reservoir

Subwatersheds

MROSD Preserves

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0
2

Midpeninsula Regional Open Space District (MROSD)

MIDPENINSULA REGIONAL OPEN SPACE

November 2014

Attachment 1

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2.4.1 On-site Vegetation

Hendrys Creek watershed supports a mix of upland plant communities including riparian woodland, mixed evergreen forest, coastal scrub, and developed/ruderal (Exhibit 2-4). These general habitat types are described briefly below. A detailed description of the specific vegetation types is provided in the attached Environmental Checklist (see Section 3.4, "Biological Resources"):

- Riparian Woodland is dominated by a canopy of native trees including alders, maples, sycamore, and bays with an understory of shrubs including poison oak, blackberry, and thimbleberry.
- Mixed Evergreen Forest is dominated by a canopy of native trees including oaks, bays, buckeyes, and maples with an understory of native shrubs and herbs such as poison oak, California hazelnut, and blackberry.
- Coastal Scrub is dominated by a dense cover of native shrubs and herbs including coyote brush, poison oak, sticky monkeyflower, and California blackberry.
- Developed/Ruderal Habitat consists of heavily disturbed areas associated with roads and former development and is either unvegetated or dominated by weedy, non-native grasses and forbs.

2.4.2 On-site Streams, Watersheds, and Aquatic Habitat

Aquatic habitats within the project site include one perennial stream (Hendrys Creek), approximately nine first or second order tributaries of Hendrys Creek, and numerous seeps and springs. These are described briefly below and in greater detail in the attached Environmental Checklist (see Section 3.4, "Biological Resources"):

- Hendrys Creek is a spring-fed perennial creek that flows from the Preserve into Lexington Reservoir in the Los Gatos Creek watershed. Hendrys Creek forms part of the headwaters of Los Gatos Creek, which has one of the largest watersheds in Santa Clara County. Vegetation along the creek is primarily well developed riparian woodland.
- Hendrys Creek Tributaries are primarily ephemeral channels that are between 2 and 5 feet wide with riparian woodland vegetation and some disturbed areas with non-native species.
- Seeps and Springs occur throughout the project site. The extensive network of groundwater seeps and springs partially feed surface water to the on-site creeks.

2.4.3 Onsite Structures

All structures and septic tanks were completely removed before POST's purchase of the property. The only improvements within the project site are unpaved roads, bridges, and culverts. Exhibit 2-5 shows areas of the project site that have been previously disturbed.

2.4.4 Public Access

The Hendrys Creek property is not currently open to the public.

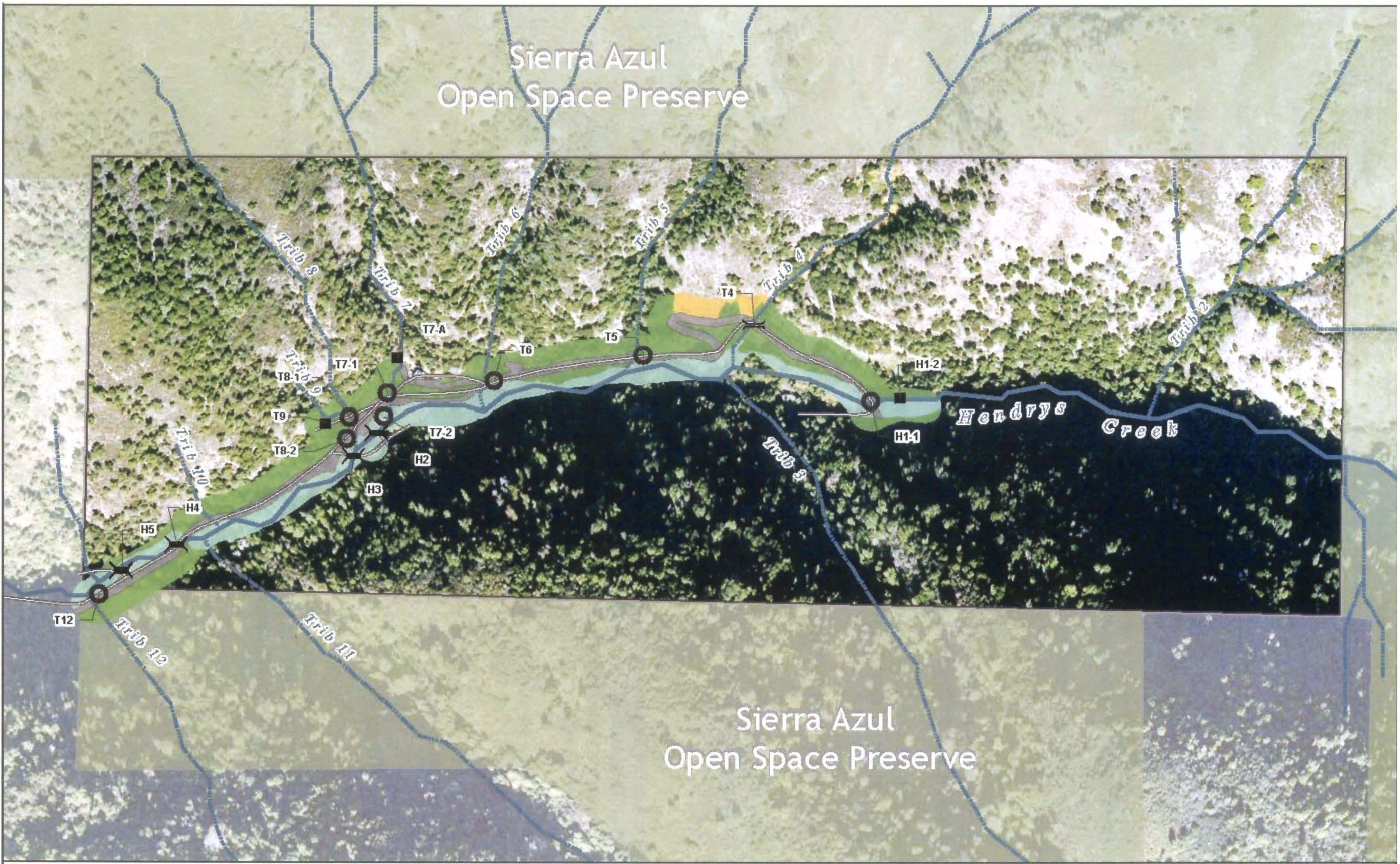

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Exhibit 2-4 **Habitat Types**

Riparian Woodland	
🟩 Mixed Evergreen Forest	▨ Ruderal/ Developed
CoastalScrub	🟩 MROSD Preserve

Midpeninsula Regional
Open Space District
(MROSD)

November, 2014

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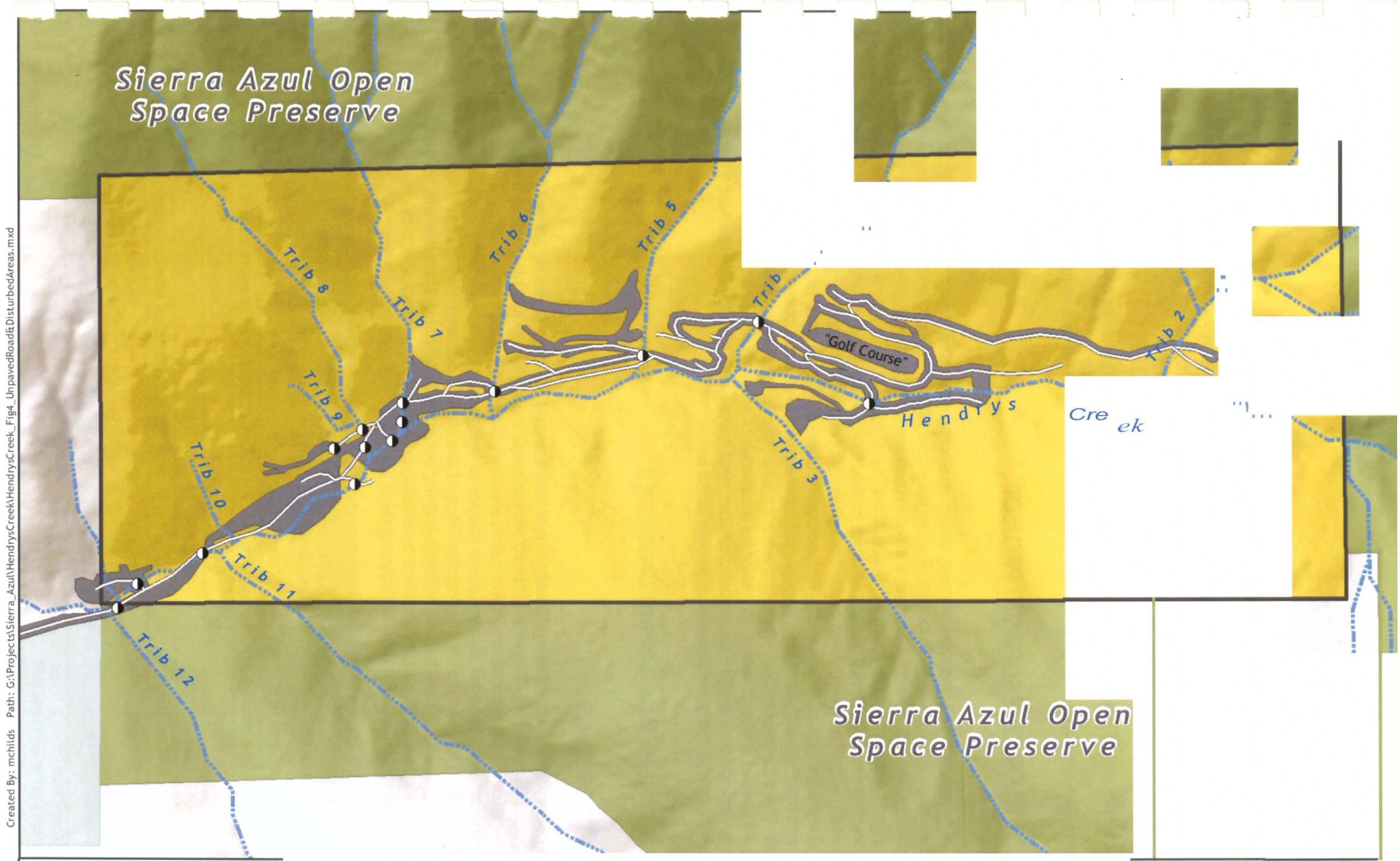
Sierra Azul Open Space Preserve
Trib 8
Trib 7
Trib 6
Trib 5
Trib
Trib 2
Trib 9
Trib 10
Trib 11
Trib 12
Trib 3
"Golf Course"
Hendrys Creek
Sierra Azul Open Space Preserve
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Exhibit 2-5 **Previously Disturbed Areas**

[:J Hendrys Creek Property

MROSD Preserves

Watershed Land

Private Property

— Disturbed Area and Unpaved Roads

() Road Crossing

Midpeninsula Regional
Open Space District
(MROSD)

Q

February, 2015

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While the District strives to use the best available digital data, this data does not represent a legal survey and is merely a graphic illustration of geographic features.

2.5 PROJECT OBJECTIVES

The proposed project is intended to achieve the following primary objectives:

- preserve, protect, and improve the ecological condition of selected local streams and their associated watersheds;
- reduce the potential for sedimentation to the aquatic environment;
- maximize long-term benefit while minimizing impacts from the restoration actions implemented; and
- maintain access throughout property for routine maintenance and emergency vehicle access.

2.6 DESCRIPTION OF PROPOSED PROJECT

The project site is accessed from an unpaved driveway along an access easement from Aldercroft Heights Road to a system of unpaved roads throughout the property. Prior to purchase of the property by POST, the unpaved roadways provided access to future home sites and a cleared meadow used as a golf green on-site. The existing roadway creek crossings within the project site are susceptible to failure after large storm events, and in some locations are contributing excessive fine-grained sediment to the Hendrys Creek watershed. A portion of the existing roadway system would be maintained to provide vehicular access within the project site for maintenance, routine patrols, and management of the property. Restoration of these crossings would reduce the potential of these degraded areas to adversely affect the streams and other natural resources, and would reduce future maintenance needs. The proposed project would include road/stream crossing improvements, and rehabilitation of disturbed adjacent upland areas. The end result will be a network of stream channels that as a system contributes less fine-grained sediment to the aquatic environment by virtue of being more resilient to large storm events. The proposed actions are described in more detail below.

2.6.1 Restoration of Road/Stream Crossings

HENDRYS CREEK CROSSINGS

There are currently five crossings on Hendrys Creek; two of these are on Hendrys Creek Road and the other three are on spur roads (Exhibit 2-6). Only one of these crossings (Crossing H4) would be needed for future access. The remaining four crossings are no longer needed and would be removed by excavating the existing fill and restoring the excavated channel. Current plans call for all bridges, culverts, and other "built" structures at road/stream crossings to be removed, including site H4, and the stream channel "daylighted" (meaning all fill material will be excavated from the channel bottom), leaving behind a functioning stream channel that is as close to a more natural state or original configuration as practical. Table 2-1 includes a description of each crossing along Hendrys Creek. Rehabilitation of Crossing H4 is described in more detail below.

Table 2-1 Hendrys Creek Crossings

Crossing Number	Location	Existing Crossing	Proposed Improvement
H1-1	Hendrys Creek Road	Culvert	Remove
H1-2	Hendrys Creek above H1-1	None	Remove existing stream blockage and associated sediment
H2	Foot Path	Bridge	Remove
H3	Spur Road	Bridge	Remove
H4	Hendrys Creek Road	Bridge	New bridge, embedded culvert, or temporary wet ford
H5	Spur Road	Bridge	Remove

Source: Best 2012, revised by MROSD

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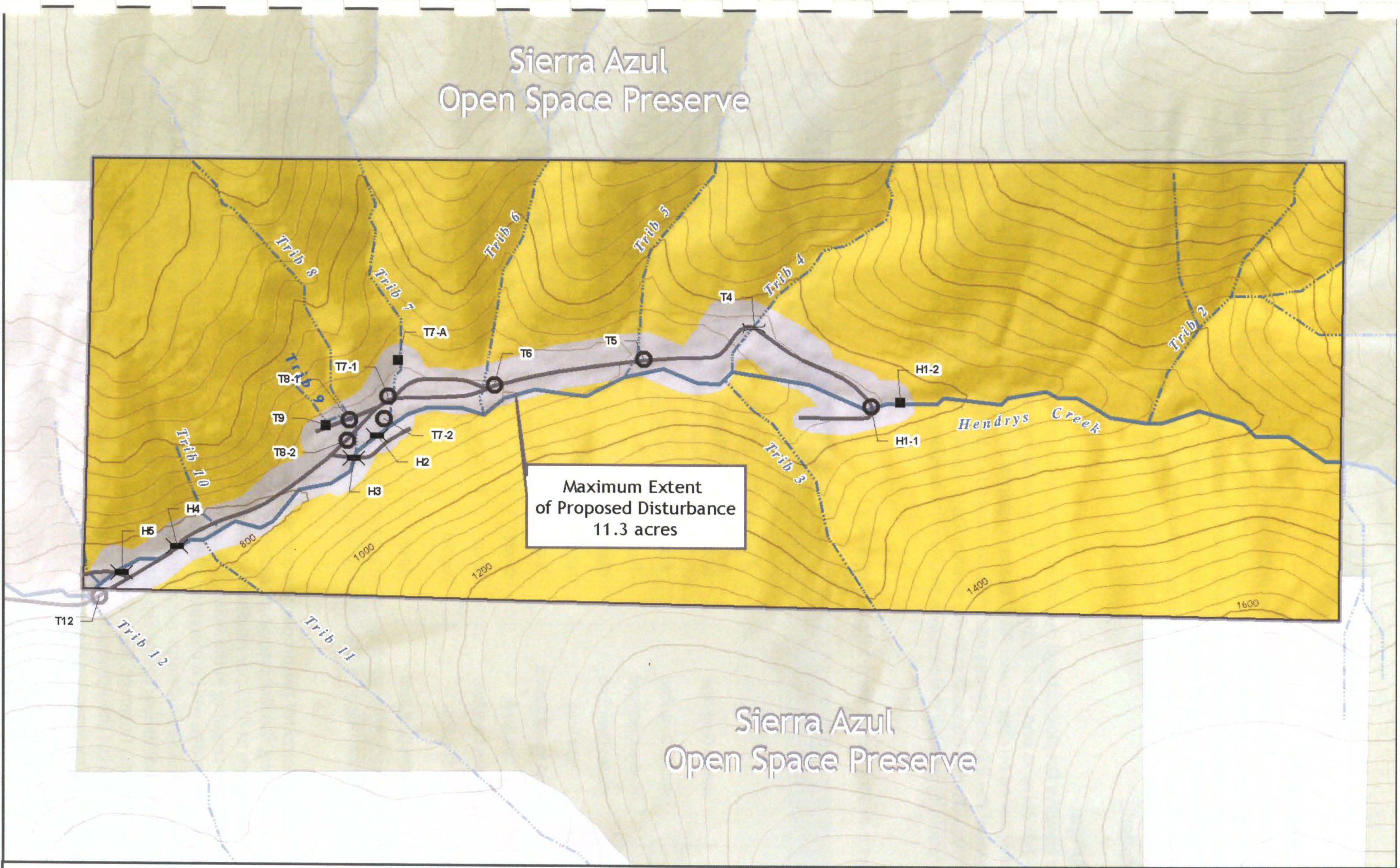


Exhibit 2-6 Crossing Locations and Proposed Area of Disturbance

Midpeninsula Regional
Open Space District
(MROSD)

February, 2015

While the District strives to use the best available digital data, this data does not represent a legal survey and is merely a graphic illustration of geographic features.

Attachment 1
Page 21 of 316

Hendrys Creek Crossing H4

Crossing H4 is currently an 11-foot bridge at Hendrys Creek Road, which is the primary access road to the interior of the property. The existing bridge was constructed within the active stream channel and has signs of degradation and undercutting by stream bank erosion, which could compromise bridge stability and safety. Because this crossing is a primary access point for the property, the existing crossing would be replaced rather than removed. The existing bridge, abutments, and fill would be removed and replaced by a temporary wet ford, embedded culvert, or new bridge. The level and area of ground disturbance would be similar for each option.

Tributary Crossings

In addition to the Hendrys Creek crossings described above, there are currently nine crossings on tributaries to Hendrys Creek (six culverts and three fords). Six of these crossings are located on Hendrys Creek Road and the other three are located on spur roads. All of these crossings are currently in poor condition, and several have failed. Several of the tributary crossings are also located on the debris fans, which places these crossings at risk for sediment deposition to the stream. Deposition could infill these crossings rendering them impassable and requiring ongoing maintenance to clear the crossings of debris or to reconstruct the crossing.

Table 2-2 includes a description of each tributary crossing.

Table 2-2 Tributary Crossings

Number	Location	Existing Crossing Type	Proposed Improvement
T4 (Upstream)	Hendrys Creek Road	Culvert	If replace w/ bridge or culvert, replace with culvert or ford. If replace with ford, realign stream and install ford or abandon.
T5	Hendrys Creek Road	Ford	Realign stream and remove
T6	Hendrys Creek Road	Ford	Realign stream and remove
T7-1	Hendrys Creek Road	Ford	Realign stream
T7-2	Spur Road	Culvert	Remove
T7-A	Graded Stream Channel	None	Restore stream channel
T8-1	Spur Road	Culvert	Remove
T8-2	Hendrys Creek Road	Culvert	Realign stream and remove
T9	Spur Road	Diverted	Maintain diversion
T12 (Downstream)	Hendrys Creek Road	Culvert	Replace with culvert or ford

Source: Best 2012; modified by MROSD

The level of future use expected for the property requires only minimal vehicular access for patrol, invasive plant removal, and monitoring the restoration activities by ATV in dry weather or on foot in inclement weather. The upper crossings at the spur roads are no longer required for vehicle or ATV access; therefore, at H4, the lowest road/stream crossing in the watershed on the property, a seasonal wet ford crossing, embedded culvert, or new bridge will be constructed to allow for seasonal patrol access via four-wheel drive all-terrain vehicle. Fords would include dips constructed through the creek channel by removing the majority of the crossing fill and reestablishing the native channel alignment where possible. Maintenance would not be required for ford crossings; however, the crossing may not be passable during periods of high runoff, and high stream flows can undercut the approaches making the crossing impassable. Crossings at the spur roads would be abandoned by removing the crossing structures and excavating any residual fill material.

There are two types of fords under consideration: 1) an unsurfaced "earth ford" or 2) a "rock ford" where the outlet and road bed are armored. Earth fords are more commonly used when the road bed is comprised of native rocky soils, such as found at Hendrys Creek, and when only seasonal access is required. Rock fords are more permanent structures constructed by armoring the outer edge of the crossing with large rock riprap and surfacing the road bed with coarse bed material. The rock used to armor the outer edge of the road would be sized to resist moving under the design storm flows. This would typically require 18-inch diameter rock that would need to be imported to the site; however, there is 12 inch rock onsite that may be used to armor some of the crossings.

2.6.2 Restoration of Disturbed Uplands

The proposed project would include rehabilitation of disturbed upland areas in addition to the creek crossings. All of the roads on the property are poorly drained with few drainage structures (e.g., dips). As a result, road runoff concentrates for long distances and results in erosion. To mitigate erosion, drainage dips would be installed approximately every 75 to 100 feet along all roads on-site.

Potentially unstable fill material also exists along some of the graded pads and along the outer edge of some roads. Because this material may be unstable, there is increased risk of erosion. These areas would be graded to remove unstable fill.

2.6.3 Public Access

Implementation of the LTMP would include designating the project as a Conservation Management Unit, and confining land uses to activities that are consistent with creek and riparian corridor protection, watershed and riparian habitat, and ecologically sensitive public enjoyment of the site.

Consistent with this designation, the project site would not be open to the general public, except for infrequent hiking tours led by MROSD docents and a limited number of hiking permits issued on a case-by-case basis for the use of existing roads in non-sensitive areas.

2.6.4 Project Construction

Construction of the proposed project is expected to take approximately three months with a maximum of six construction workers on-site at any given time. Equipment and materials would be temporarily stored on-site during construction of the proposed project. Equipment and materials would be limited to that needed to perform rehabilitation work. Total estimated area of disturbance is 11.3 acres. Project construction would occur during the daytime on weekdays and Saturdays.

Best management practices (BMPs) would be implemented during construction including placing silt fencing and wattles around storage areas for equipment and materials. Equipment and materials storage areas would be sited outside of sensitive habitats, and in areas with little to no slope to prevent transport of material. Any disturbed areas would be revegetated following construction.

The construction contractor would comply, to the extent practical and feasible, with the following the Bay Area Air Quality Management District (BAAQMD) standard BMPs during project construction to reduce emissions of criteria air pollutants:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) will be watered two times per day.

- All haul trucks transporting soil, sand, or other loose material off-site will be covered.

- All visible mud or dirt track-out onto adjacent public roads will be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads will be limited to 15 miles per hour.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations). Clear signage shall be provided for construction workers at all access points
- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
- A sign will be posted in a publicly visible location with the telephone number and person to contact at MROSD regarding dust complaints. This contact person will respond and take corrective action within 48 hours of complaints. The BAAQMD's phone number will also be visible to ensure compliance with applicable regulations.

2.6.5 Maintenance and Operation

The overall long-term management goal for the project site is to enhance the aquatic habitats and native vegetation on-site through monitoring, adaptive management, and restoration, if needed. Long-term management of the project site would include conducting ongoing patrols and monitoring of streams, springs, native vegetation, and habitats to determine stability and trends. Invasive species would also be monitored and removed as needed. Long-term management of the property would be primarily conducted by MROSD's Operations, Planning, Real Property, and Natural Resources departments, and other staff as appropriate in close coordination with the SCVWD as the Conservation Easement holder.

A phased approach would be undertaken to provide long-term maintenance and management of the biological resources within the project site. In the first phase, the biological resources would be evaluated and mapped to establish a baseline, and priorities and a schedule for implementation actions would be developed. This phase would last several months and would occur in the first spring and summer following adoption of the LTMP. During the second phase, which is expected to be approximately six (6) years, actions would be taken to control stream erosion and remove high priority invasive plants. The third phase would consist primarily of annual monitoring to detect and respond to events such as floods or fires, and would consist of routine management that would continue in perpetuity.

As part of its maintenance of the project site, MROSD would evaluate invasive plants on-site, and make recommendations for work that would require the use of pesticides. A limited number of herbicides would be allowed for use at the project site, and no herbicides would be used within 15 feet of water. Manual control treatments may also be used for the removal of small weed populations, individual occurrences, and populations near special-status species and their habitat or sensitive natural communities. Additionally, manual weed removal may be used as a follow-up treatment in areas where larger populations have been sprayed with an herbicide. An Integrated Pest Management Program was recently approved that directs these maintenance activities. A separate Environmental Impact Report evaluated the potential impacts of these District-wide activities.

Equipment and materials would also be stored on-site periodically for maintenance and management purposes. Equipment would be limited to that needed to perform work.

BMPs similar to those described above for construction would be used for any equipment or materials storage areas.

The project site would be monitored and maintained as part of the routine management of the Preserve, and no additional staffing would be required for management of the project site. The proposed project provides very limited additional public access and amenities: therefore, maintenance activities are expected to generate few, if any, additional vehicle trips (i.e., no more than 2 trips per day).

3 ENVIRONMENTAL CHECKLIST

PROJECT INFORMATION

1.	Project Title:	Hendrys Creek Long-Term Management Plan (LTMP)
2.	Lead Agency Name and Address:	Midpeninsula Regional Open Space District (MROSD) 330 Distel Circle, Los Altos, CA 94022
3.	Contact Person and Phone Number:	Meredith Manning, (650) 691-1200
4.	Project Location:	20610 Aldercroft Heights Road, Los Gatos, CA, unincorporated Santa Clara County (Assessor's Parcel Numbers 558-27-007, 558-27-008 & 558-51-005)
5.	Project Sponsor's Name and Address:	Santa Clara Valley Water District 5750 Almaden Expressway San Jose, CA 95118-3686 Midpeninsula Regional Open Space District 330 Distel Circle Los Altos, CA 94022-1404
6.	General Plan Designation:	Santa Clara County: HS (Hillside)
7.	Zoning:	Santa Clara County: Hillside
8.	Description of Project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or offsite features necessary for its implementation. Attach additional sheets if necessary.) See attached project description.	
9.	Surrounding Land Uses and Setting: (Briefly describe the project's surroundings)	Adjacent land uses consist predominantly of residential, recreational, and open-space use. Please see attached project description.
10:	Other public agencies whose approval is required: (e.g., permits, financing approval, or participation agreement)	▪ Santa Clara Valley Water District (Approval of the LTMP and Conservation Easement) ▪ U.S. Army Corps of Engineers (USACE) (Section 404 Permit) ▪ California Department of Fish and Wildlife (CDFW) (Section 1602 and 2080.1 compliance) ▪ Regional Water Quality Control Board (RWQCB) (Section 401 certification) ▪ Bay Area Air Quality Management District (BAAQMD) (notification of demolition)

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics
☐ Agriculture and Forest Resources
☐ Air Quality
☐ Biological Resources
☐ Cultural Resources
☐ Geology / Soils
☐ Greenhouse Gas Emissions
☐ Hazards & Hazardous Materials
☐ Hydrology / Water Quality
☐ Land Use / Planning
☐ Mineral Resources
☐ Noise
☐ Population / Housing
☐ Public Services
☐ Recreation
☐ Transportation / Traffic
☐ Utilities / Service Systems
☐ Mandatory Findings of Significance
☒ None With Mitigation

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial evaluation:

D I find that the proposed project could not have a significant effect on the environment, and a **NEGATIVE DECIARATION** will be prepared.

I find that although the proposed project COULD have a significant effect on the environment, there WILL NOT be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A **MITIGATED NEGATIVE DECIARATION** will be prepared.

D I find that the proposed project **MAY** have a significant effect on the environment, and an **ENVIRONMENTAL IMPACT REPORT** is required.

D I find that the proposed project **MAY** have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **ENVIRONMENTAL IMPACT REPORT** is required, but it must analyze only the effects that remain to be addressed.

D I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier **EIR** or **NEGATIVE DECIARATION** pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier **EIR or NEGATIVE DECIARATION,** including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Jane Mark
Signature

3/19/2015
Date

Jane Mark, AICP
Printed Name

Planning Manager
Title

Midpeninsula Regional Open Space District
Agency

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3. Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4. "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
    a) Earlier Analysis Used. Identify and state where they are available for review.
    b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
    c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9. The explanation of each issue should identify:
    a) the significance criteria or threshold, if any, used to evaluate each question; and
    b) the mitigation measure identified, if any, to reduce the impact to less than significance.

3.1 AESTHETICS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. Aesthetics. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

3.1.1 Environmental Setting

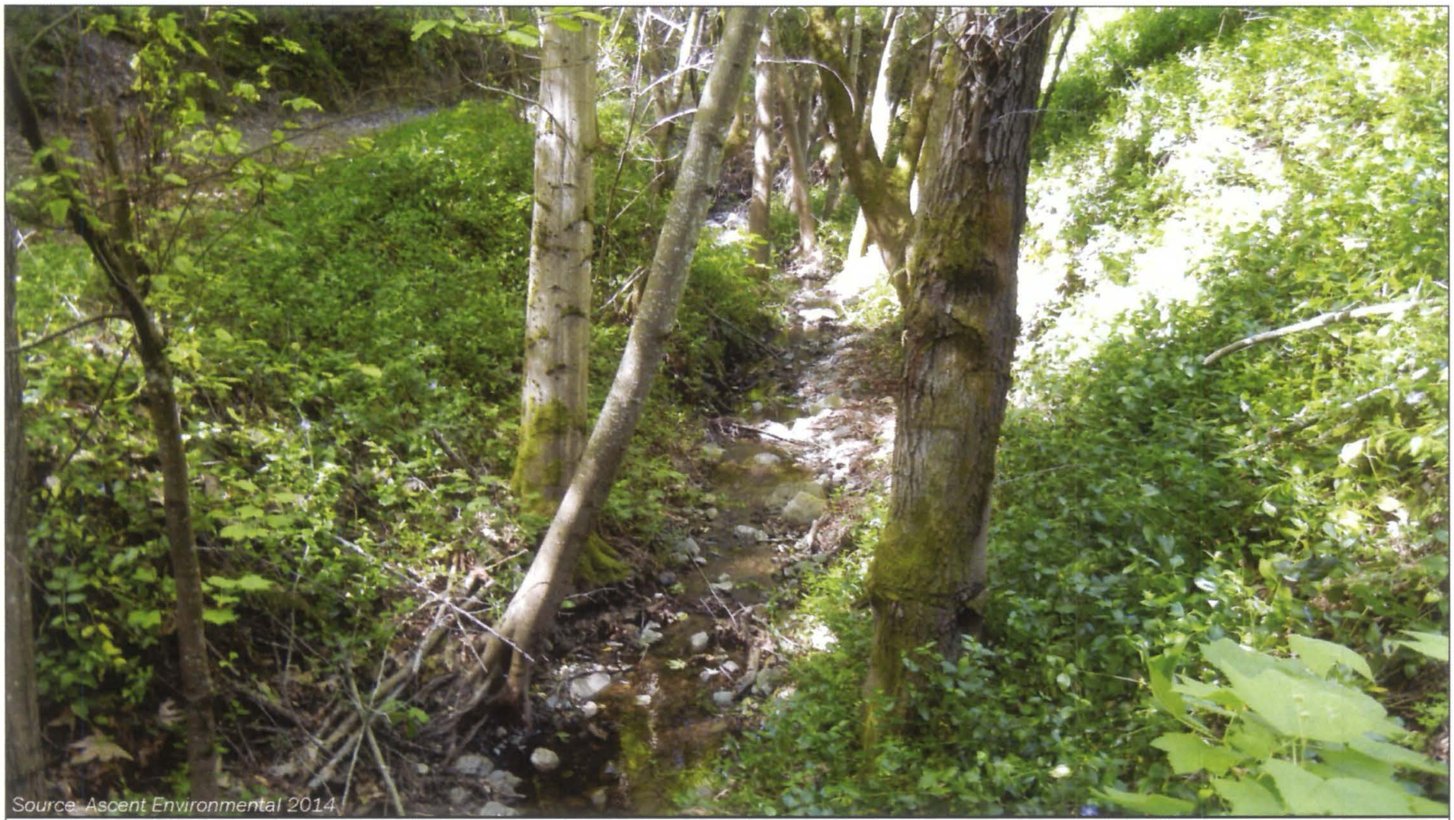
The project site has a high degree of visual quality (Exhibits 3.1-1 through 3.1-3) that is characterized by steep, rugged topography and dense, intact, native California bay forest. The water features that transverse the property contribute to the site's high scenic quality, including several tributaries, drainages and springs, all of which flow into Hendrys Creek canyon. Much of Hendrys Creek has a step pool configuration with a waterfall near the northern portion of the property. The site is largely undeveloped, with the development being limited to several unpaved roads with creek crossings (Exhibits 3.1-4 and 3.1-5) and leveled pads for former home sites.

Views from the property are largely obscured by intervening vegetation and topography; however, surrounding open space within the Preserve can be viewed to the north, south and east from the higher elevations. The Preserve has a high scenic quality generally characterized by the beauty and ruggedness of unspoiled wildlands. The highest portions of the project site offer some scenic views; however, the property is not open to the public and access to these areas is limited by steep topography and dense vegetation.

State Route 17, which is eligible for listing as a State-designated scenic highway (Caltrans 2013), is located approximately 1.5 miles west of the project site. However, views of the project site from the highway are obscured by vegetation and topography.

MROSD policies included in the "Resource Management Policies" document (MROSD 2011) are intended to reduce District-wide visual impacts. Applicable Resource Management Policies include minimizing evidence of human impacts by minimizing visibility of infrastructure and maintaining significant natural landscapes by controlling vegetation to maintain scenic views and requiring tenants to maintain landscapes.

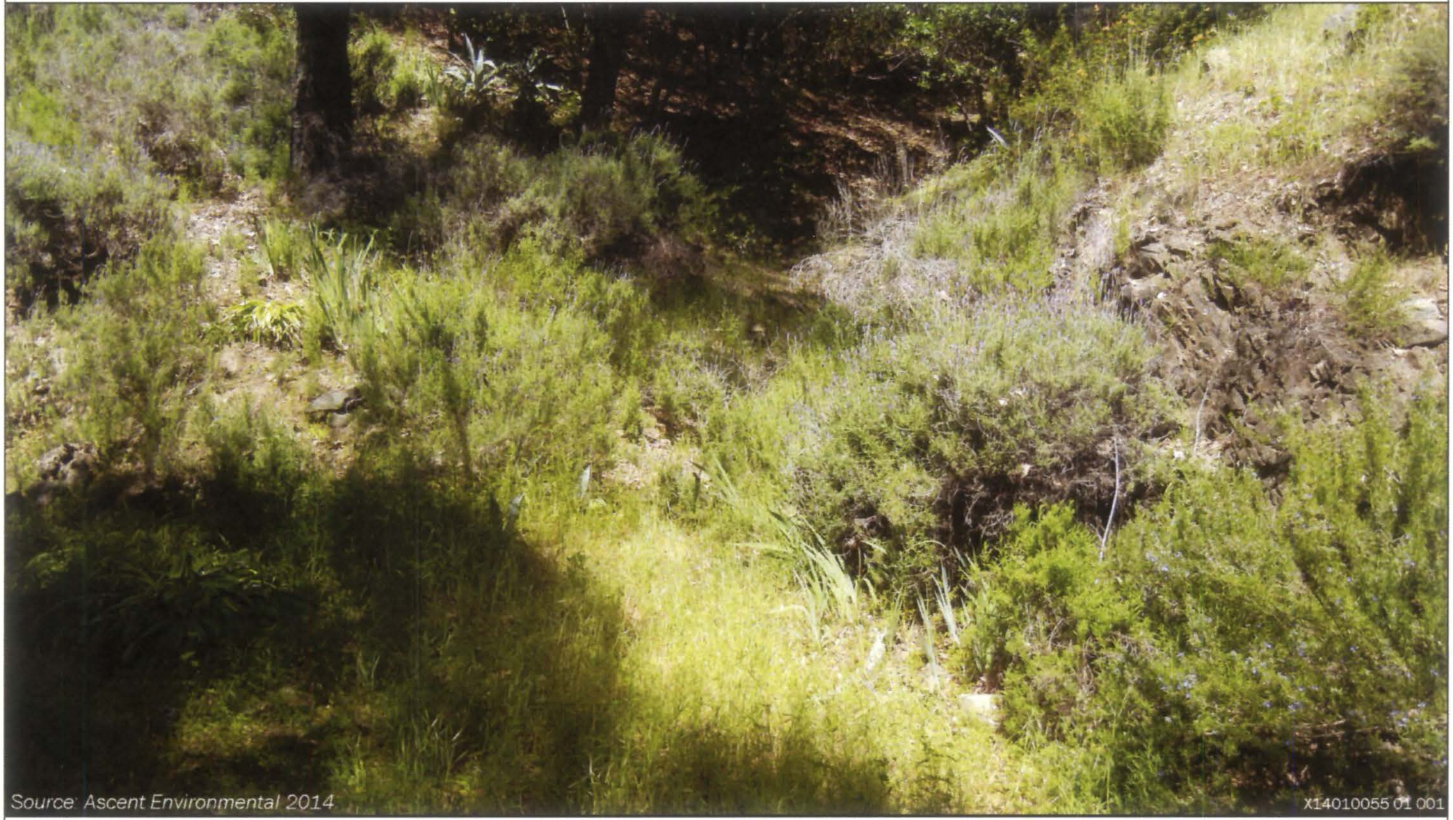
Nighttime views in the project area are very dark and generally free of light pollution. There are currently no sources of light or glare within the property.



Source: Ascent Environmental 2014

Exhibit 3.1-1

Hendrys Creek Channel



Source: Ascent Environmental 2014

X14010055 01 001

Exhibit 3.1-2

Hendrys Creek Channel with Crossing

Source: Ascent Environmental 2014

Exhibit 3.1-3 **Tributary**

Source: Ascent Environmental 2014

X14010055 01 002

Exhibit 3.1-4 **Access Road**

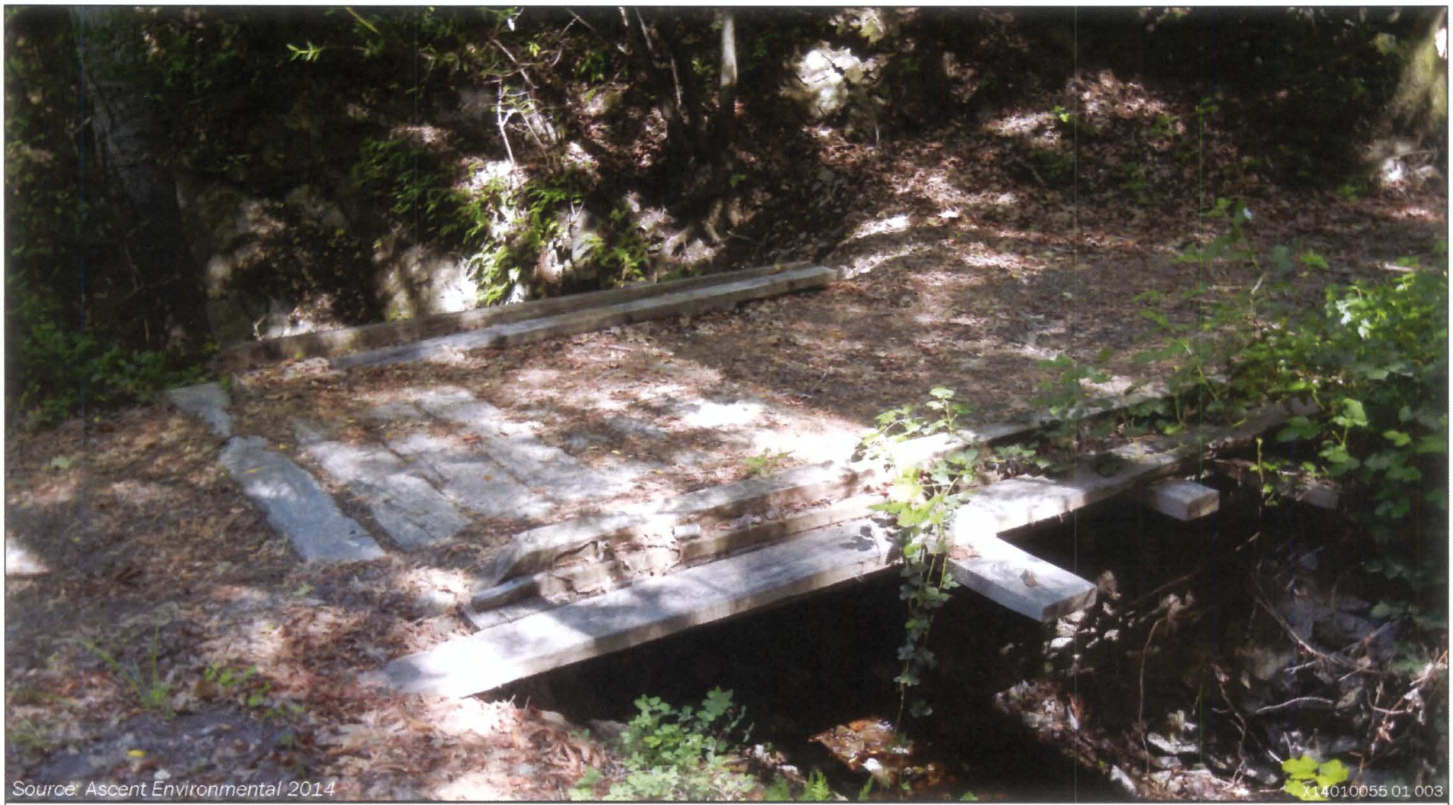


Exhibit 3.1-5 Hendrys Creek Crossing H4

3.1.2 Discussion

a) Have a substantial adverse effect on a scenic vista?

No Impact. The majority of off-site views from the property are obscured by topography and vegetation; therefore, scenic viewpoints within the property are generally limited to those from the highest elevations. However, views from these scenic vistas are currently not available to the public, and implementation of the proposed project would only allow limited public access to the site. In addition, the proposed project would involve minor physical modifications that would generally improve the visual character of the site by removing man-made features and restoring the creek to a more natural condition. These improvements would be confined primarily to within and along the waterways within the property. Therefore, these changes would not interfere with any existing scenic views (either onsite or offsite). *No impact* would result.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

No Impact. The nearest scenic highway to the project site is State Route 17, which is approximately 1.5 miles to the west. Views of the proposed project would not be visible from State Route 17 because of intervening vegetation, topography, and distance. The proposed project would include removal or replacement of degraded road crossings, which would improve the visual character of the project site by returning Hendrys Creek to a more natural state. The proposed project would not result in tree removal or removal of rock outcroppings. Therefore, because the proposed project would not substantially damage scenic resources that could be visible from a state scenic highway, *no impact* would occur.

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

Less than Significant. There would be some temporary changes to the visual character of the project site during construction due to presence of construction equipment and materials; however, due to intervening topography, vegetation, and distance, these changes would not be clearly visible from surrounding areas. Implementation of the proposed project would include replacement or removal of degraded road crossing across Hendrys Creek and its tributaries. Removal or replacement of the crossings would improve the visual character of the project site and return the site to a more natural state by removing human made structures that are currently in poor condition. In addition, only limited vehicle access would be allowed on the project site so there would be very little increase in the number of viewers that would have visual access to the changes. The proposed changes would not be visible from off site. Therefore, the proposed project would improve the project site and would not result in substantial degradation of the existing visual character or quality of the site. This would be a *less-than-significant* impact.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

No Impact. The proposed project includes no development of structures or other occupied facilities and would not include any new lighting or other sources of light or glare. Construction activities would occur during the daytime hours and would not require the use of nighttime lighting. Public access would be allowed only during periodic site tours led by MROSD staff, which would only occur during the day. The project would result in *no impact* on light and glare.

3.2 AGRICULTURE AND FOREST RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
II. Agriculture and Forest Resources.				
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997, as updated) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.				
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☒	☐
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☒	☐
e) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

3.2.1 Environmental Setting

The majority of the Hendrys Creek Property is natural wildlands with steep hillsides, and is not in agricultural production. In addition, the project site is not designated as Farmland of Statewide or Local Importance, Unique Farmland, or Prime Farmland by the Farmland Mapping and Monitoring Program (FMMP). The FMMP designates the land within the project site and surrounding area as "Other Land" (land that does not meet the criteria of any of the other categories) (Department of Conservation 2012).

The California Land Conservation Act of 1965—commonly referred to as the Williamson Act—enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. In return, landowners receive property tax assessments which are much lower than similarly situated properties because they are based upon farming and open space uses as opposed to full market value. Local governments receive an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971. The project site is divided into three parcels, and Parcels 1 and 2, which total 116 acres of the 117-acre property, are subject to a Williamson Act Contract dated February 17, 1977, with the County. The remaining one-acre parcel is not subject to this contract. The former owner requested a non-renewal of these contracts in 2007 (Parcel 2) and 2008 (Parcel 1), but they will remain in effect throughout the nine-year non-renewal period (until 2017 and 2018 respectively). However, maintenance of project site in its natural state for the purpose of preserving open space is one of the compatible uses allowed in the Williamson Act Contract for the site.

3.2.2 Discussion

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

No Impact. The FMMP identifies the project site as "other land." No Prime Farmland, Unique Farmland, or Farmland of Statewide or Local Importance occurs on the project site (Department of Conservation 2012). In addition, no agricultural uses exist on the project site and no grazing currently occurs within project site. The proposed project would include preservation of open space and removal of road crossings along Hendrys Creek, and therefore would not preclude use of the property for agricultural purposes in the future. The proposed project would have *no impact* on the conversion of Prime, Unique, or Farmland of statewide importance.

b) Conflict with existing zoning for agricultural use or a Williamson Act contract?

Less than Significant. The Santa Clara County General Plan designates the property as Hillside, which allows for agricultural uses, mineral extraction, low-density recreation, land in its natural state, wildlife refuges, very low density residential development, and commercial, industrial, or industrial uses that require remote settings or support recreation or appreciation of the natural environment. Thus, preservation of the project site as open space and removal of stream crossings would be consistent with the current zoning.
The majority of the project site (116 acres) is in the 9-year non-renewal period of a Williamson Act contract, which will terminate by 2018.Compatible uses under the Williamson Act, as amended, include "Open Space Use" and "Recreational Use." "Recreational Use" is defined in the Williamson Act (Cal. Government Code 51201(n)) as the use of land in its agricultural or natural state by the public, with or without charge, for any of the following: walking, hiking, picnicking, camping, swimming, boating, fishing, hunting, or other outdoor games or sports for which facilities are provided for public participation.

MROSD's mission to preserve, protect, and maintain lands as open space meets the intent and purpose of the Williamson Act, and preservation of the project site as open space with limited recreational access is consistent with the Williamson Act. Therefore, the project would result in a *less-than-significant* impact associated with conflicts with zoning or Williamson Act contracts.

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

No Impact. As mentioned above under "b," the project site is zoned as Hillside, which is not considered forest land or timberland. The proposed project would not require a rezoning of the project site. The proposed project would only minimally remove or trim live trees, dead trees, brush and/or woody debris where required for stream channel restoration, by fire protection agencies, for treatment of disease, for public safety, for patrol vehicle access, for recreational limited access, or fire breaks including for defensible space purposes at utility lines or at the Property lines, and would not require substantial tree removal. Therefore, the project would result in *no impact* related to conflicts with the zoning of forest land or timberland.

d) Result in the loss of forest land or conversion of forest land to non-forest use?

Less than Significant. The project site does not contain any timberlands and riparian forest within the site located along Hendrys Creek and tributaries. Implementation of the proposed project does not include development of new structures or facilities that would require tree removal or conversion of riparian forest. As described in Section 3.4, "Biological Resources," any disturbance to riparian areas as a result of road crossing removal would be temporary and would be fully restored to an improved state following construction. In addition, recreational access within the property would be limited by MROSD, with permits granted on a case-by-case basis and periodic staff-led tours, so there would be no long-term loss of riparian forest due to overuse. Therefore, implementation of the proposed project would result in a *less-than-significant* impact on loss of forest land.

e) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

No Impact. Implementation of the proposed project would not involve other changes that could result in conversion of farmland or forest land to non-agricultural or non-forest use. As described in the discussions under "a" through "d" above, implementation of the proposed project would result in *no impact* related to conversion of agricultural or forest land.

3.3 AIR QUALITY

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
III. Air Quality. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

3.3.1 Environmental Setting

The project site is located in Santa Clara County, which lies within the jurisdiction of BAAQMD. Santa Clara County is in State nonattainment for ozone, $PM_{2.5}$, and PM_{10}. Santa Clara County is in federal nonattainment for ozone, $PM_{2.5}$, and unclassified for PM_{10}.

Air quality within Santa Clara County is regulated by such agencies as the U.S. Environmental Protection Agency, and California Air Resources Board (ARB) at the federal and state levels, respectively, and locally by the BAAQMD. The BAAQMD seeks to improve air quality conditions in Santa Clara County through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The clean air strategy of the BAAQMD includes the development of programs for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations, and issuance of permits for stationary sources. BAAQMD also inspects stationary sources, responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements other programs and regulations required by the federal Clean Air Act, federal Clean Air Act Amendments of 1990, and the California Clean Air Act.

BAAQMD's June 2010 adopted thresholds of significance were challenged in a lawsuit. On March 5, 2012 the Alameda County Superior Court issued a judgment finding that BAAQMD had failed to comply with CEQA when it adopted the thresholds. The court found that the adoption of the thresholds was a project under CEQA and ordered BAAQMD to examine whether the thresholds would have a significant impact on the environment under CEQA before recommending their use. The court issued a writ of mandate ordering BAAQMD to set aside the thresholds and cease dissemination of them until BAAQMD had complied with

CEQA. The court's order permits BAAQMD to develop and disseminate these CEQA Guidelines, as long as they do not implement the thresholds of significance.

As discussed in BAAQMD's updated CEQA guide that was released in May 2012, an analysis of environmental impacts under CEQA includes an assessment of the nature and extent of each impact expected to result from the project to determine whether the impact will be treated as significant or less than significant. CEQA gives lead agencies discretion whether to classify a particular environmental impact as significant. Ultimately, formulation of a standard or "threshold" of significance requires the lead agency to make a policy judgment about where the line should be drawn distinguishing adverse impacts it considers significant from those that are not deemed significant. This judgment must, however, be based on scientific information and other factual data to the extent possible. (State CEQA Guidelines Section 15064[b]).

As discussed above, due to the existing court order on BAAQMD's adopted 2010 CEQA Thresholds of Significance, BAAQMD cannot recommend specific thresholds of significance for use by local governments at this time. BAAQMD states that lead agencies will need to determine appropriate air quality thresholds to use for each project they review based on substantial evidence that they should include in the administrative record for the project. One resource BAAQMD provides as a reference for determining appropriate thresholds is the CEQA Thresholds Options and Justification Report developed by staff in 2009 (BAAQMD 2009). The CEQA Thresholds Options and Justification Report outlines substantial evidence supporting a variety of thresholds of significance.

MROSD has independently reviewed BAAQMD recommended thresholds from June 2010 including BAAQMD's Justification Report which explains the agency's reasoning for adopting the thresholds, and determined that they are supported by substantial evidence and are appropriate for use to determine significance in the environmental review of this project. Specifically, MROSD has determined that the BAAQMD thresholds are well-founded based on air quality regulations, scientific evidence, and scientific reasoning concerning air quality. Therefore, for the purposes of this project, the following thresholds of significance, as included in the aforementioned report, will be used to determine if an impact on air quality would be significant. The project would result in a significant air quality impact if it would result in an exceedance of any of the following levels:

- reactive organic gases (ROG): 54 lbs/day;
- nitrogen oxides (NO_X): 54 lbs/day;
- particulate matter, exhaust (PM_{10}): 82 lbs/day;
- particulate matter, exhaust ($PM_{2.5}$): 54 lbs/day; and
- particulate matter, fugitive dust ($PM_{2.5}$/PM_{10}): best management practices (BMPs)

3.3.2 Discussion

a) Conflict with or obstruct implementation of the applicable air quality plan?

Less than Significant. The emission inventories used to develop a region's air quality attainment plans are based primarily on projected population growth and vehicle miles traveled (VMT) for the region, which are based, in part, on the planned growth identified in regional and community plans. Therefore, projects that would result in increases in population or employment growth beyond that projected in regional or community plans could result in increases in VMT above that planned in the attainment plan, further resulting in mobile source emissions that could conflict with a region's air quality planning efforts. Increases in VMT beyond that projected in area plans generally would be considered to have a significant adverse incremental effect on the region's ability to attain or maintain state and federal ambient air quality standards.

The proposed project would include road/stream crossing improvements and rehabilitation of disturbed upland areas. In addition, the project site would be designated as a Conservation Management Unit; the project site would not be open to the general public, except for limited recreational access by MROSD permit, granted on a case-by-case basis, and periodic staff-led tours. Thus, the proposed project would not generate demand for any new permanent employees or result in an increase in visitors or associated vehicle trips (e.g., employee trips, visitation trips). Temporary construction activities would result in slight increases in trips associated construction workers. However, these would be temporary and would only occur during the 3-month construction period. The project would not result in any new employment opportunities or new housing and, therefore, it would not change the amount of development projected for Santa Clara County, and it would be consistent with the population growth and VMT projections contained in the BAAQMD's AQMP. The project would not interfere with the region's ability to attain or maintain state and national ambient air quality standards. Thus, implementation of the proposed project would not conflict with or obstruct implementation of any air quality planning efforts. As a result, this impact would be *less than significant.*

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Less than Significant. Operation of the project would not result in any increases in mobile sources and therefore this is not discussed further. Implementation of the proposed project would result in minor construction activities. The use of heavy equipment would be minimal and would be primarily limited to removal of creek crossings and restoration of associated uplands. Therefore, emissions of criteria air pollutants (e.g., NO_X, ROG, and Diesel PM) would be minimal and project construction activities would not result in emissions of criteria air pollutants that could exceed applicable BAAQMD emissions thresholds. Emissions associated with construction were estimated and compared to BAAQMD emissions thresholds as shown in Table 3.3-1, below. Detailed model outputs are also included in Appendix B of this IS/MND.

Table 3.3-1 Maximum Project Construction Emissions (lbs/day)

	ROG	NO_x	PM_{10} Exhaust	PM_{10} Fugitive Dust	$PM_{2.5}$ Exhaust	$PM_{2.5}$ Fugitive Dust
Maximum Construction Daily Emissions	0.9	8.0	0.5	13.6	0.44	7.5
BAAQMD Threshold	54	54	82	Implement BMPs	54	Implement BMPs

Notes: BMP = best management practice

Source: Modeled by Ascent Environmental from BAAQMD CalEEMod 2015

Although emissions of criteria air pollutants, including emissions of fugitive dust (i.e., PM_{10} and $PM_{2.5}$) would be below applicable BAAQMD thresholds, all projects within the BAAQMD jurisdiction are required to implement BMPs during construction activities. As described in the project description, the project would implement BMPs during construction activities that would further reduce fugitive dust and exhaust emissions. These include watering of exposed surfaces twice daily, covering all haul trucks carrying dust or loose material, reducing vehicle speeds on unpaved roads, reducing engine idle times, using well maintained equipment, and cleaning dirt track-out from construction equipment daily. Therefore, project-generated emissions would not violate or contribute substantially to an existing or projected air quality violation. This impact would be *less than significant.*

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Less than Significant. Past, present and future development projects contribute to the region's adverse air quality impacts on a cumulative basis. By its very nature, air pollution is largely a cumulative impact. No single project is sufficient in size to, by itself, to result in nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulatively significant adverse air quality impacts. As explained in BAAQMD's CEQA Guidelines, and consistent with CEQA, if a project's contribution to the cumulative impact is considerable, then the project's impact on air quality would be considered significant.

In developing thresholds of significance for air pollutants, air districts consider the emission levels for which a project's individual emissions would be cumulatively considerable. If a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. Thus, as discussed in the analysis under item "b" above, project-generated emissions would not exceed applicable thresholds and, therefore, would not violate an existing air quality standard. Additionally, the project would not result in an increase in mobile source emissions, and construction-related emissions would be minimal and temporary (i.e., 3 months) and below the applicable thresholds of significance. As a result, project-generated emissions of criteria air pollutants and precursors would not be cumulatively considerable. This impact would be a *less than significant.*

d) Expose sensitive receptors to substantial pollutant concentrations?

Less than Significant. No demolition would occur as part of the proposed project. The project would result in removal of several stream crossings; however, the crossings are primarily made of wood and steel with some concrete reinforcement. These materials do not typically contain asbestos; therefore there is no potential for the release of asbestos and this issue is not discussed further.

As discussed in "b" above, project implementation would not result in regional (e.g., ROG, NO_X, PM_{10}) or local (e.g., carbon monoxide) emissions of criteria air pollutant or precursors from construction or operational-related activities.(e.g., ROG, NO_X, PM_{10}) that would exceed applicable thresholds of significance. Thus, project-generated criteria air pollutant and precursor emissions would not expose sensitive receptors to substantial pollutant concentrations.

The project would result in short-term diesel exhaust emissions from onsite construction equipment. Particulate exhaust emissions from diesel-fueled engines (diesel PM) were identified as a TAC by the ARB in 1998. The potential cancer risk from the inhalation of diesel PM, as discussed below, outweighs the potential for all other health impacts (ARB 2003), so diesel PM is the focus of this discussion.

The primary source of diesel PM from the proposed project would be from construction-related activities (e.g., exhaust from off-road heavy diesel equipment). Sensitive receptors surrounding the project site include residences located in the hills on either side of Aldercroft Heights Road located over 1,000 feet from the proposed disturbance area (see Exhibit 3.12-1 in in Section 3.12, "Noise"). Based on the emission modeling conducted, the highest level of PM_{10} (i.e., diesel PM) that would occur on the worst construction day would be less than 1 lb/day (See Table 3.3-1 above). This level is substantially lower than the recommended threshold of 82 lbs/day. Additionally, the construction phase would be very short (i.e., 3 months) and would involve minor earthwork. Thus, considering the substantially low amount of emissions predicted from this project and the short duration of construction-related activities, the project would not be anticipated to result in the exposure of sensitive receptors to substantial pollutant concentrations.

As discussed above, the project would result in regional (e.g., ROG, NO_X, PM_{10}) or local (e.g., carbon monoxide) emissions of criteria air pollutant or precursors from construction or operational-related activities.(e.g., ROG, NO_X, PM_{10}) that would exceed applicable thresholds of significance. In addition, the project would include BMPs during construction, to the extent practical and feasible, that would further reduce short-term construction emissions. These include watering of exposed surfaces twice daily, covering all haul trucks carrying dust or loose material, reducing vehicle speeds on unpaved roads, reducing engine idle times, using well maintained equipment, and cleaning dirt track-out from construction equipment daily. Construction would be relatively short in duration (i.e., 3 months) and estimated diesel PM emissions would be considered low. Thus, project-related construction and operation would not expose nearby sensitive receptors to substantial levels of pollutants and this impact would be *less than significant.*

e) Create objectionable odors affecting a substantial number of people?

Less than Significant. The occurrence and severity of odor impacts depend on numerous factors, including the nature, frequency, and intensity of the source; wind speed and direction; and the presence of sensitive receptors. Although offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress and often generating citizen complaints to local governments and regulatory agencies.

BAAQMD has established Regulation 7 (Odorous Emissions) to address odor issues. Regulation 7 places general limitations on odorous substances and specific emission limitations on certain odorous compounds. Project implementation would not result in any major sources of odor and the project type is not one of the common types of facilities or activities that are known to produce odors (e.g., landfill, coffee roaster, wastewater treatment facility). In addition, the diesel exhaust from the use of heavy equipment during construction activities would be intermittent and temporary, and would dissipate rapidly from the source with an increase in distance. In this case, sensitive receptors are located over 1,000 feet away from any construction-related odor source. Also, construction activity would not occur at any single location for an extended period of time. Therefore, project implementation would not create objectionable odors affecting a substantial number of people. As a result, this impact would be *less than significant.*

3.4 BIOLOGICAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. Biological Resources. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?	☐	☐	☒	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☒	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

3.4.1 Environmental Setting

The following discussion is based on the vegetation, habitat, and species description included in the LTMP.

HABITAT AND SPECIES DESCRIPTIONS

The majority of the Hendrys Creek Property is comprised of natural wildlands with steep hillsides. The Hendrys Creek project area provides high quality natural habitat for many species including the San Francisco dusky-footed woodrat, mountain lion (*Puma concolor*), bats, and Nuttall's woodpecker (*Picoides nuttallii*) and contains mature riparian forest, perennial seeps and springs, oak/bay forests, chaparral, rock outcrops, and preserved jurisdictional waters of the United States. Scattered stands of non-native annual grass and French broom (*Genista monspessulana*) also occur on areas where the former building pads were located.

A map of the vegetation communities (categorized based on the CNPS Manual of California Vegetation 1995) is included below as Exhibit 3.4-1. A map of the stream corridors on the property is included as Exhibit 2-3 in Chapter 2, "Project Description."

Watershed and Stream Corridor Characteristics

The riparian canyon of the Hendrys Creek watershed traverses the project site with over 2.4 miles of streams, including one perennial multi-order stream (Hendrys Creek) and at least nine first or second order tributaries of Hendrys Creek (Exhibit 2-3).

Hendrys Creek is a spring-fed perennial creek which flows from the Sierra Azul Preserve into Lexington Reservoir. Hendrys Creek forms part of the headwaters of Los Gatos Creek, which has one of the largest watersheds in Santa Clara County. The Los Gatos Creek has a total drainage area of 55 square miles, 37 of which are located upstream of Lexington Reservoir. Los Gatos Creek starts from the headwaters and its smaller tributaries northwest of Loma Prieta Peak and traverses northwestward collecting contributions from various smaller tributaries and empties into Lake Elsman into which Austrian Gulch Creek flows as well. Los Gatos Creek continues its northwest path to its confluence with Hendrys Creek at the upstream end of Lexington Reservoir, a groundwater recharge reservoir. Los Gatos Creek exits the north end of Lexington Reservoir and flows northward through the City of Los Gatos and to its terminus at Guadalupe River near downtown San Jose.

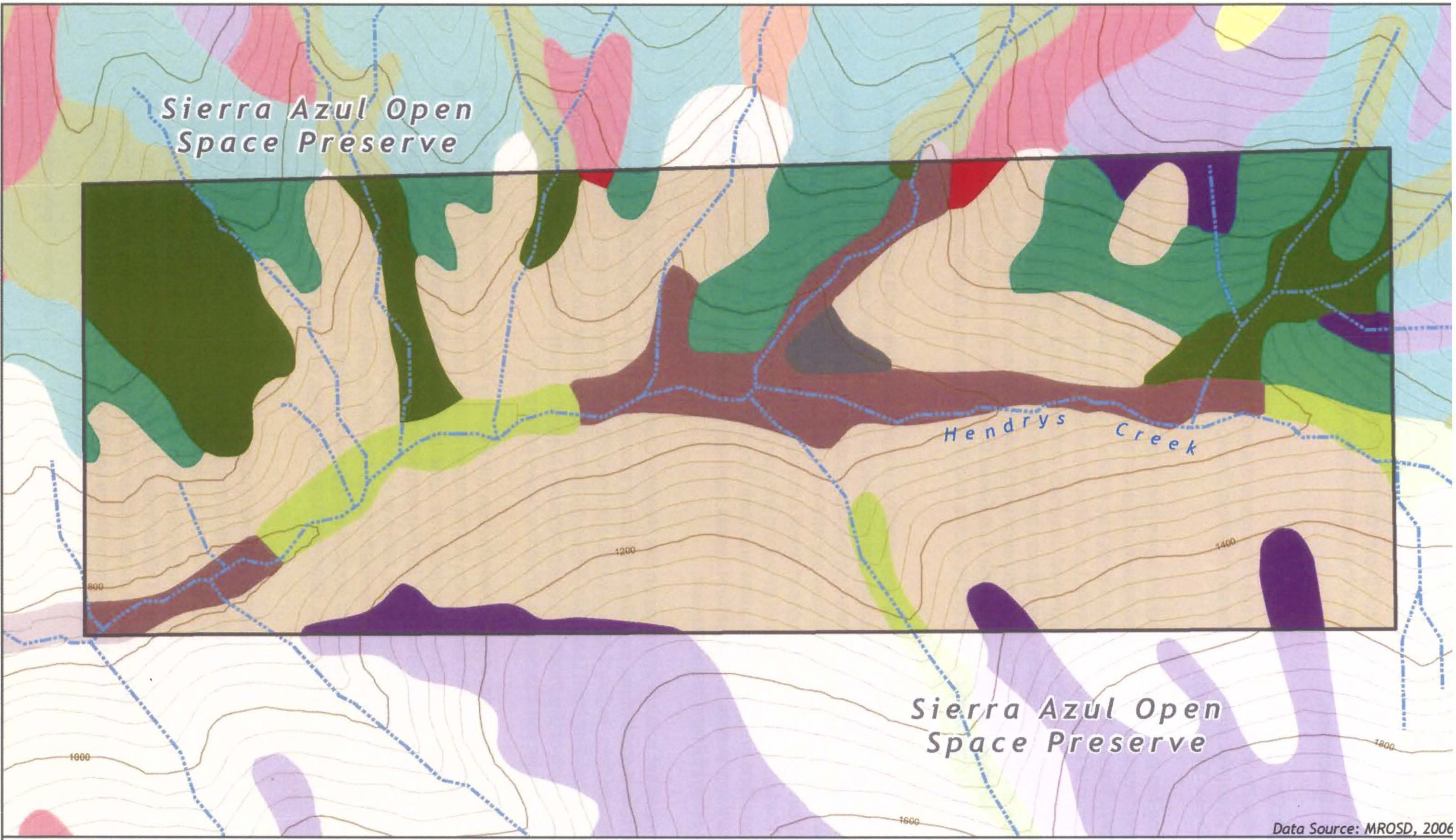
The Hendrys Creek tributaries drain narrow and steep gradient watersheds. The north uppermost slopes of the watershed are prone to landslides. These existing and potential new landslides are subject to accelerated soil erosion. The project site is located on the low-gradient depositional reach of Hendrys Creek, and is therefore more likely to be the location where the stream's natural sediment and debris load is deposited. Debris fans have formed at the mouths of these drainages from naturally high sediment loads and infrequent debris flow landslides that extend down the tributary channel. The tributary stream channels draining across the debris fans are generally shallow and their location can naturally change over time in response to large depositional events. These natural events are likely to continue in the future regardless of any rehabilitation work or careful land management.

Fire has also been an important natural influence on the Hendrys Creek watershed. Much of the upper Los Gatos Creek watershed is in a state of regeneration and forest succession from major past disturbances including historic logging and fires. In July 1985, a wildfire burned 22 square miles of steep, predominantly chaparral-covered terrain extending from Lexington Reservoir to the top of Priest Rock Trail to Loma Prieta. The burned area included much of the Property's upper hillsides along the north side. The burned area may still be prone to mass downslope soil movements when the heavy rains occur.

Potential septic discharges and all water supply diversions on the Property that could have degraded surface water quality have been removed with the elimination of the former mobile home trailers and residence sites in winter of 2011/2012. Similarly, the active heavy road use, grading and clearing associated with the residential use of the Property has been eliminated, further benefitting water quality and general stream conditions. No known water supply diversions, septic tanks or human-influenced soil disturbance occurs upstream. In the Property's current condition, potential for lowered water quality still exists when high sediment runoff is prevalent. This condition could occur during periods of high rainfall and surface water runoff along roadways, at road/stream crossings, disturbed level clearings, or areas affected by future fire or earthquake events.

Hendrys Creek and its tributaries are well-shaded by mature riparian vegetation. The extremely permeable streambeds are well-drained and rocky, dominated by native gravels, blocky cobbles, and bedrock. Only minimal large woody debris is present and the banks are of native soils. Much of Hendrys Creek has a step pool configuration with a waterfall present near the uppermost end of the project site, and a large rock cascade present near the upper end of a tributary. Tributary channels are predominantly confined by bedrock slopes. All streams appear laterally and vertically stable with little or no evidence of direct human modification outside of the disturbed areas associated with the road system and former residence sites.

Created By: jhawk Path: G:\Projects\Sierra_Azul\HendrysCreek\HendrysCreek_Fig5_Veg.mxd


Sierra Azul Open Space Preserve
Hendrys Creek
800
1200
1400
1000
1600
1800
Sierra Azul Open Space Preserve

Data Source: MROSD, 2006

Exhibit 3.4-1 Vegetation Communities

- 🟩 1111 - California Bay Association
- 🟫 1120 - California Bay - Coast Live Oak Multiple Series Mapping Unit
- ⬜ 1222 - Douglas-fir - California Bay Association
- 🟫 1320 - White Alder Series
- 🟩 2320 - Big-leaf Maple Series
- 🟩 3110 - Chamise Series
- 🟪 3130 - Chamise - Mixed Manzanita Multiple Series Mapping Unit
- 🟥 3150 - Birch-leafed Mountain Mahogany - Mesic Chaparral Mapping Unit
- 🟨 4310 - California Annual Grassland Series
- ⬛ 9300 - Built-up / Urban Disturbance
- 🟧 9410 - Landslides, Cliffs, Rock Outcrops

Midpeninsula Regional
Open Space District
(MROSD)

July, 2012

REGIONAL OPEN SPACE

Feet 0 500 1,000

While t ict stri se the ilable lata, tl does n sent a rvey a rely a illustra geogra tures.

In these disturbed areas the channel, geometry is evolving to adjust to in-stream modifications, with recent landslide debris present in the streambed. Flooding does not appear to be an issue due to the permeability of the soil, although road crossing failure during high flow events remains a distinct possibility.

The Project site contains numerous seeps and springs, many of which were partly developed to facilitate use for residential drinking water, now no longer occurring. Based upon topographic map interpretation and site observations, groundwater flow beneath the site is inferred to be in a westerly direction towards Lexington Reservoir. No ponds are present on the project site. Two small instream ponds are found downstream on the adjacent private property. Streams, seeps and springs are considered to be sensitive habitats due their potential support for special-status species.

Floodplains and uplands on the project site are predominantly in a natural, vegetated condition. No impervious surfaces exist on or upstream of the Property. Human influences affecting floodplain and upland conditions consist of the road system and the level clearings formerly occupied by residential structures which contain exotic garden plants and occurrences of invasive plants.

Vegetation Characteristics and Habitat Types

General Vegetation Characteristics

Site vegetation is primarily native and includes well-developed stream side and hillside forests, including dense, intact, native California bay (*Umbellularia californica)* forests and areas of chamise (*Adenostoma facsciculatum*) chaparral blanketing the upper slopes. Coast live oak (*Quercus agrifolia*) is also common, and other typical hardwood forest species of the Santa Cruz range, such as California buckeye (*Aesculus californicus*) and madrone (*Arbutus menziesii*) are present but not as abundant. In addition to the predominant woodland species of the site, dense-canopied deciduous riparian forests occur along Hendrys Creek and some tributaries. Big-leaf maple (*Acer macrophyllum*), white alder (*Alnus rhombilfolium*), and some scattered, very large California sycamores (*Platanus racemosa*) are present. Steep moist bedrock exposures host numerous fern species. Giant chain fern (*Woodwardia fimbriata*) is present at the seeps and springs. Exhibit 3.4-1, Vegetation Map, shows the distribution of these plant communities based on the CNPS Manual of California Vegetation 1995 system. Each mapping unit depicted within the Property boundary in Exhibit 3.4-1 is described in more detail below.

Disturbance events such as wildfires in the region and repeated human influences may have altered the historic distribution of plant communities on the site. The interspersed pattern of the shrublands and forest on the site's northwestern upper slopes areas may be the result of fire patterns from the recent major fire. Invasive plants are present in the disturbed, former residential areas of the Property. The sunny upland clearings are bordered by invasive French broom (*Genista monspessulana*), and the some creek banks are covered with invasive periwinkle (*Vinca major*).

California Bay Association

This habitat type is found scattered on hillsides and along streams throughout the northern half of the Property and is dominated (greater than 75% relative cover) by dense (greater than 80%), intact California bay forests. A few scattered big-leaf maple, alder, and mixed hardwoods are also found in the overstory of this habitat association.

California Bay-Coast Live Oak Multiple Series Mapping Unit

The California Bay–Coast Live Oak Multiple Series Mapping Unit dominates in the areas immediately upslope of the Hendrys Creek riparian corridor. It is a mixed broad-leaved evergreen forest with dense components of California bay, madrone and coast live oak in the overstory; California bay and coast live oak co-dominate.

White Alder Series

Dense-canopied deciduous riparian forest, classified as white alder series, occurs along portions of Hendrys Creek as well as tributaries 4 and 5. This series is noted to be found primarily in the mid and upper portions of watersheds along perennial streams. White alder dominates, but big-leaf maple, California bay and some large California sycamores are also present.

Big-leaf Maple Series

The big-leaf maple series mapped on the project site consists of dense-canopied deciduous riparian forest along the remaining portions of Hendrys Creek not mapped as white alder series. It also occurs along stream 3, a tributary to Hendrys Creek. This habitat type is dominated by big-leaf maple with California bay also contributing to the overstory.

Chamise Series

This habitat type is found blanketing the upper slopes in the northern half of the Property. Dense chamise dominates with greater than 80% relative cover. Other chaparral species can be found as a minor component at the edges of the mapped polygons. Some of the open areas within this habitat type are covered with dense mats of bushy spikemoss (*Selaginella bigelovii*), which is unusual in the Santa Cruz Mountains although more common farther south.

Chamise-Mixed Manzanita Multiple Series Mapping Unit

Small areas of the chamise-mixed manzanita multiple series mapping unit are also found on the upper slopes of the project site in slightly more mesic settings than the pure stands of chamise. As the name suggests, various species of manzanita including brittle-leaf Manzanita (*Arctostaphylos crustacean* ssp. *crustacea*) codominate with chamise in this habitat type.

Birch-leafed Mountain Mahogany-Mesic Chaparral Mapping Unit

Two small areas of birch-leafed mountain-mahogany-mesic chaparral mapping unit are mapped on upper slopes in the northern part of the project site. This habitat type is characterized by birch-leafed mountain mahogany (*Cercocarpus betuloides* var. *betuloides*) interspersed with other chaparral species.

Built-up/Urban Disturbance

Until recently, the Hendrys Creek project site contained numerous unpermitted structures, trailers, and a former recreational golf green located on numerous level pads that had been cleared and graded. The location mapped as built-up/urban disturbance occurs near the confluence of Hendrys Creek and Stream 4, and is the area where the most concentrated prior residential use had occurred. The only improvements that remain on the project site are bridges, roads, and culverts, but residual disturbed habitat remains in this area, in particular.

Wildlife

The project site provides many of the physical and biological resources required by wildlife for survival and reproduction. The site potentially provides habitat for a suite of special-status species and migratory songbirds in addition to a wide variety of more common species.

Riparian and seasonal or perennial aquatic habitat is present along the streams, comprised of deciduous forest (alder or maple-dominated) or mixed evergreen forest (bay and oak) similar to that of adjacent upland slopes. Stream-related habitat provides benefits to several species in the form of shade, cover, nesting opportunities, and food. Stream habitats also serve as important movement corridors for a variety of wildlife species. The stream habitats intergrade with the dense bay forests and chamise chaparral of the project site, providing additional habitat variety.

Common Species

The project site is known or expected to support a wide array of bird, mammal, amphibian and reptile species including: Pacific treefrog (*Hyla regilla*), California newt (*Taricha torosa*), California slender salamander (*Batrachoseps attenuatus*), Pacific giant salamander (*Dicamptodon tenebrosus*), western fence lizard (*Sceloporus occidentalis*), northern alligator lizard (*Elgaria coerulea*), Santa Cruz garter snake (*Thamnophis atratus*), gopher snake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*), California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), Northern flicker (*Colaptes auratus*), Nuttall's woodpecker, Bewick's wren (*Thryomanes bewickii*), California towhee (*Pipilo crissalis*), black phoebe (*Sayornis nigricans*), dark-eyed junco (*Junco hyemalis*), Western scrub-jay (*Aphelocoma californica*), Steller's jay (*Cyanocitta stelleri*), Botta's pocket gopher (*Thomomys bottae*), brush rabbit (*Sylvilagus bachmani*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), mountain lion, and black-tailed deer (*Odocoileus hemionus*).

Native fish assemblages in Hendrys Creek are assumed to be potentially similar to that of Los Gatos Creek, which hosts riffle sculpin (*Cottus gulosus*), California roach (*Lavinia symmetricus*) Sacramento suckers (*Catostomus occidentalis*), and rainbow trout (*Oncorhynchus mykiss*), the landlocked form of steelhead trout. However, the two instream impoundments as well as the culvert underneath Alma Bridge Road downstream are most likely a barrier to fish passage onto the Property. Juvenile trout were observed in Hendrys Creek in August 2004.

Endangered and Threatened Species

California Red-legged Frog

The multiple drainages on the project site may serve as refugia and foraging habitat and movement corridors for California red-legged frog (CRLF), which, in addition to its federal listing, is also a state species of special concern. CRLF breeding is likely not present on the site due to the steepness of the streams and the absence of any off-stream ponds.

No CRLF have been observed on the project site, to date; however, extensive surveys have not been conducted the species. Five documented occurrences of CRLF are found within 1.5 miles of the site. The two closest locations are approximately 2,500 feet downstream of the project site where Hendrys Creek joins Lexington Reservoir.

Rare Species and Species of Special Concern

There are several other sensitive species known or expected to utilize the Property. Some of these species are discussed in more detail below.

Foothill yellow-legged Frog

The foothill yellow-legged frog (FLYF) is a state species of special concern with the potential occur on the project site. Potential refugia, foraging habitat, and movement corridors for this species are present. The existing conditions assessment prepared for MROSD's Sierra Azul Preserve in 1999 identified FYLF in several areas within the Preserve. The closest sighting is a historic occurrence just upstream of the subject property on MROSD land (1968). The Los Gatos Creek mainstem likely provides suitable habitat for FYLF, and the steeper tributaries of Hendrys Creek may also serve as refugia, foraging habitat, and movement corridors for the FYLF. Surveys were conducted for FYLF several times in 2013-14 and they were not found despite historical observations nearby.

San Francisco Dusky-footed Woodrat

The San Francisco dusky-footed woodrat, a state species of special concern, has been observed by MROSD staff on the project site. Given the riparian nature of the species and the minimal human disturbance in the vicinity of the site, woodrats are expected to thrive on the project site and throughout the upper Los Gatos Creek watershed.

Other Sensitive Species

In addition to the species above, a number of other special-status species could potentially occur on the project site based on the presence of suitable habitat and/or documented occurrences nearby, and information collected by MROSD biologist as a component of the LTMP. Table 3.4-1 provides a list of special-status species and describes their potential to occur on the project site.

Table 3.4-1 Potential for Sensitive Species to Occur on the Project site

Common Name	Scientific Name	Federal Status[1]	State Status[1]	Other Status[1]	Potential to Occur on the Project Site[2]
AMPHIBIANS					
California red-legged frog	*Rana draytonii*	Threatened	SCC		L, Drainages provide foraging and refugia, however, the site lacks suitable breeding habitat due to due its steepness and the absence of off-stream ponds, Known to occur within 2,500 ft of project site.
Foothill yellow-legged frog	*Rana boylii*	None	SSC		M, Drainages provide foraging, refugia, and movement corridors, however, none have been identified during recent surveys conducted in 2014-15.
REPTILES					
Western pond turtle	*Emys marmorata*	None	SSC		U, Potential movement corridors, but the narrow canyon does not provide open aquatic habitat. In-stream impoundments offsite downstream may be used periodically. Marginal nesting habitat present in localized areas on south-facing slopes.
BIRDS					
Cooper's hawk	*Accipiter cooperii*	None	WL		L, Dense forested areas provide suitable foraging and nesting habitat.
Sharp-shinned hawk	*Accipiter striatus*	None	WL		L, Dense forested areas provide suitable foraging and nesting habitat.
Ferruginous hawk	*Buteo regalis*	BCC	WL		L, May forage in onsite grassland, chamise, and outcroppings. Site lacks large tracts of open grassland, sparse shrub or desert habitat typical of foraging. Not known to nest in California.
Osprey	*Pandion haliaetus*	None	WL		U, Site lacks open water habitat suitable for foraging, and snag trees adjacent to open water for nesting.
Vaux's swift	*Chaetura vauxi*	None	SSC		L, Lacks typical lake and pond foraging habitat, but may forage over forested, grassland, and chamise habitats in the site. Forested areas and bridges provide suitable structure for cup nests.
Allen's hummingbird	*Selasphorus sasin*	BCC	None		L, Scrub, chaparral, and forests areas suitable nesting and foraging habitat
Nuttall's woodpecker	*Picioides nuttallii*	BCC	None		O. Oak woodlands provide suitable nesting and foraging habitat.
Olive sided flycatcher	*Contopus cooperi*	BCC	SSC		L, Forested areas provide suitable nesting and foraging habitat.

Table 3.4-1 Potential for Sensitive Species to Occur on the Project site

Common Name	Scientific Name	Federal Status[1]	State Status[1]	Other Status[1]	Potential to Occur on the Project Site[2]
Yellow warbler	*Dendroica petechia brewsteri*	BCC	SSC		U, Site lacks typical willow and cottonwood riparian nesting sites.
Purple martin	*Progne subis*	None	SSC		U, Site lacks concentration of nesting cavities with low canopy cover and relatively open air space, or suitable large bridges.
Oak titmouse	*Baeolophus inornatus*	BCC	None		L, Forested and riparian areas provide suitable foraging and nesting habitat.
MAMMALS					
Townsend's big-eared bat	*Corynorhinus townsendii*	None	Candidate Threatened		U. Typically roost in caves or cave analogues - tunnels, mineshafts, buildings, and older bridges. No such structures exist within the proposed disturbance area.
Western red bat	*Lasirurs blossevillii*	None	SSC		L, Suitable roosting trees in forested areas and foraging habitat over grasslands and chamise.
Pallid bat	*Antrozous pallidus*	None	SSC		L, Suitable roosting sites in trees and under small bridges, may forage in grasslands, shrublands, and forested areas.
San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*	None	SSC		O, Known to nest in riparian areas within the site.
PLANTS					
Mt. Hamilton fountain thistle	*Cirsium fontinale* var. *campylon*	None	None	CRPR 1B.2	U, Site lacks suitable serpentine seeps or streams.
Brewer's clarkia	*Clarkia breweri*	None	None	CRPR 4.2	U, Site lacks suitable serpentine soils.
Santa Clara Red ribbons	*Clarkia concinna* ssp. *automixa*	None	None	CRPR 4.3	M, Chamise and woodlands may provide suitable habitat, but the species has not been observed during preliminary surveys.
Serpentine phlox-leaf bedstraw	*Galium andrewsii* ssp.	None	None	CRPR 4.2	U, Site lacks suitable serpentine soils.
Loma Prieta hoita	*Hoita strobilina*	None	None	CRPR: List 1B.1	U, Site lacks suitable serpentine soils.
Serpentine leptosiphon	*Leptosiphon ambiguous*	None	None	CRPR 4.2	U, Site lacks suitable serpentine soils.
Large-flowered leptosiphon	*Leptosiphon grandiflorus*	None	None	CRPR 4.2	U, Site lacks typical sandy habitat. Species was not observed during preliminary surveys of the area.
Serpentine phlox-leaf bedstraw	*Leptosiphon grandiflorus*	None	None	CRPR 4.2	U, Site lacks suitable serpentine soils.
Woolly-headed lessingia	*Lessingia hololeuca*	None	None	CRPR 3	U, Site lacks suitable serpentine soils.
Smooth lessingia	*Lessingia micradenia* var. *glabrata*	None	None	CRPR 1B.2	U, Site lacks suitable serpentine soils.
Spring lessingia	*Lessingia tenuis*	None	None	CRPR 4.2	M, May occur in opening in chaparral and woodland habitats.
Robust monardella	*Monardella villosa spp. globosa*	None	None	None	U, Typically occurs in forested, chaparral, or grassland habitats with rocky soils sedimentary in origin.

Table 3.4-1 Potential for Sensitive Species to Occur on the Project site

Common Name	Scientific Name	Federal Status[1]	State Status[1]	Other Status[1]	Potential to Occur on the Project Site[2]
Woodland woolythreads	*Monolopia gracilens*	None	None	CRPR: List 1B.2	U, Site lacks suitable serpentine soils.
Metcalf Canyon jewelflower	*Streptanthus glandulosus* ssp. *albidus*	Endangered	None	CRPR 1B.1	U, Site lacks suitable serpentine soils.

Notes:

[1] Status codes: BCC = Fish and Wildlife Service: Birds of Conservation Concern; SSC = California Species of Special Concern; WL=Watch List; CRPR = California Rare Plant Ranks -Plants rare, threatened, or endangered in California (formerly CNPS Lists)

[2] O=observed on site, L=Likely to occur, M=May occur, U=unlikely to occur

Biological Connectivity

The project site is linked on all sides to existing open space, park and watershed lands, promoting biological connectivity. The adjoining Sierra Azul Open Space Preserve contains a wide variety of habitats supporting many wildlife species and contains considerable biodiversity.

3.4.2 Discussion

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?

Less than Significant with Mitigation Incorporated. Two special-status wildlife species: San Francisco dusky-footed woodrat and Nuttall's woodpecker have been documented within the project site, and ten others are likely to or may occur, including California red-legged frog, Foothill yellow-legged frog, Coopers Hawk, Sharp-shinned hawk, Vaux's swift, Allen's hummingbird, Olive sided flycatcher, oak titmouse, pallid bat, and western red bat. Trees, shrubs, and herbaceous vegetation within the project site may also provide nesting habitat for bird species protected under the Migratory Bird Treaty Act and California Fish and Game Code. In addition, 29 special-status plants have been documented in the project vicinity, many of which occur on serpentine soils which are not within the project area. Three of the special status plant species, Santa Clara red ribbons, Spring lessingia, and robust monardella have been identified within three miles of the project site and may occur, but have not been observed during preliminary surveys of the property.

Special-Status Amphibians and Reptiles

Although no special-status amphibians or reptiles have been documented within the project site, California red-legged frog and Foothill yellow-legged frog have potential to occur. California red-legged frog is federally listed as threatened and considered a species of special concern by California Department of Fish and Wildlife (CDFW). For successful reproduction, this species requires deep pools in slow-moving streams or ponds with riparian and/or emergent marsh vegetation. The project site does not support breeding habitat for California red-legged frog; however, low numbers may stray into the site during certain times of the year for foraging, sheltering, and dispersal along Hendry's Creek (MROSD 2012a). (Note that the CNDDB search identified occurrence of western pond turtle, a CDFW species of special concern, within three miles of the project site; however, the potential for occurrence on the project site is considered low because the creek's narrow canyon within the site does not provide open aquatic habitat.)

Potential refugia, foraging habitat, and movement corridors for Foothill yellow-legged frog are present on the project site, and individuals have historically been observed adjacent to the project site. Although this species was not identified in the most recent surveys, it is possible that this species could be present on the project site.

Implementation of the LTMP is intended to improve the quality of stream habitat and therefore may also improve conditions for California red-legged frog by removing creek crossings that are causing erosion and restoring Hendrys Creek and its tributaries to a more natural state. However, California red-legged frog could be affected during removal and replacement of the creek crossings or other in-stream work occurring within the project site, potentially resulting in direct mortality during construction.

In the short-term, BMPs, described in Chapter 2, "Project Description," would be implemented, including reducing erosion from construction, not storing equipment in environmentally sensitive areas, and using silt fencing and wattles around stockpiles. Long-term measures (also described in Section 2) to reduce impacts to sensitive species would include monitoring, adaptive management in areas where habitat degradation is occurring, and management of invasive species. Although these measures would reduce short-term and long-term impacts on special-status amphibians and reptiles, and the proposed project is expected to improve habitat in the long term, the potential still exists for short-term impacts to occur during construction. Because individual California red-legged frog CRLF may accidentally be injured by construction equipment or smothered during sediment removal, this impact is considered potentially significant.

Mitigation Measure 3.4-1

MROSD shall implement the following measures to avoid and minimize impacts to California red-legged frog and Foothill yellow-legged frog.

- Worker Education Seminar. Prior to conducting any action that may negatively affect listed species, all staff, contractors and persons associated with the project shall attended a worker-education seminar delivered by a qualified MROSD biologist or other qualified biologist. The seminar shall include written information regarding California red-legged frog and Foothill yellow-legged frog identification, natural history and habitat, legal status, and provisions and penalties under the Endangered Species Act, as applicable. Names and phone numbers of the biological monitors and USFWS and CDFW contacts should be included in the written information. MROSD shall maintain a signature sheet to document compliance, which will be made available upon request.

- Biological Construction Monitoring. A qualified biologist shall conduct a pre-activity survey for California red-legged frog and Foothill yellow-legged frog prior to implementing actions that include ground disturbance, vegetation removal, or other activities associated with culvert or crossing removal that could otherwise harm California red-legged frog or Foothill yellow-legged frog. A qualified biologist shall inspect the work area while vegetation and debris is removed during the initial phase of construction. If no California red- legged frogs or Foothill yellow-legged frogs are observed during either the pre-activity survey or during removal of vegetation and debris, then work may proceed without a qualified biologist present. If California red-legged frogs or Foothill yellow-legged frog are observed at any time before or during construction within the work area by anyone involved in the project, work shall cease and USFWS and/or CDFW shall be contacted for guidance.

Special-Status Mammals

Potential roosting habitat for pallid bat and western red bat occurs in mature trees and snags on the project site, and possibly (though unlikely) under the small bridges spanning Hendrys Creek or in the man-made bat houses. Pallid bat and western red bat are considered species of special concern by CDFW. In addition, seven San Francisco dusky-footed woodrat houses have been observed within the project site primarily in mixed evergreen forest and coastal scrub habitats, and more are expected to occur in the surrounding area (MROSD 2012a). Dusky-footed woodrat is also considered a species of special concern by CDFW. Roost destruction, or work in close proximity to roost sites, could result in adverse impacts to special-status bat species, and ground disturbance associated with project construction could adversely impact woodrat houses. Therefore, this impact is considered *potentially significant*.

Mitigation Measure 3.4-2

MROSD shall implement the following measures to avoid and minimize impacts special-status mammals.

- Special-Status Bats. Within 30-days prior to initiating ground disturbance or vegetation removal, a qualified bat biologist shall inspect the area of disturbance and areas adjacent (within 50 feet) for bat roosts (most likely mature trees and snags and possibly (although unlikely) under the small bridges spanning Hendrys Creek. Surveys will consist of a daytime pedestrian survey looking for evidence of bat use (e.g., guano) and/or an evening emergence survey to note the presence or absence of bats. The type of survey will depend on the condition of the habitat. If no bat roosts are found (excluding the bat houses), then no further study is required. If evidence of bat use is observed, the number and species of bats using the roost will be determined. Bat detectors may be used to supplement survey efforts, but are not required. If roosts of pallid or western red, bats are determined to be present within the survey area, direct disturbance to the roost, such as tree removal or bridge replacement that are occupied by bats, shall be avoided during the breeding season (April 1 through August 31). The bat roosts will not be disturbed.

- San Francisco Dusky-Footed Woodrat. Within 30 days prior to project construction, a qualified biologist shall inspect the disturbance area and adjacent areas within 50 feet for woodrat houses. If none are found, then no additional measures are necessary. If a woodrat house is identified within 50 feet of the work area, an exclusion zone shall be erected around the existing woodrat houses using flagging or a temporary fence that does not inhibit the natural movements of wildlife (such as steel T-posts and a single strand of yellow rope or similar materials). The work area shall be relocated as necessary to avoid impacting woodrat houses, even if avoidance is by only a few feet. If woodrat houses cannot be avoided by the trail, CDFW shall be contacted for approval to relocate individuals by live-trapping and building a nearby artificial house as a release site. Approval to relocate shall be acquired from CDFW.

Nesting Birds

Nesting habitat is present for Coopers Hawk, Sharp-shinned hawk, Vaux's swift, Allen's hummingbird, Olive sided flycatcher, and oak titmouse as well as other native birds in trees, shrubs, and herbaceous vegetation on the project site and surrounding area. Vegetation removal, as well as noise and other disturbance during construction, could adversely impact nesting bird species, if present, potentially resulting in nest destruction or abandonment. This impact is considered *potentially significant*.

Mitigation Measure 3.4-3

MROSD shall limit vegetation removal to the minimum necessary to conduct the project. For all construction activities that could result in potential noise and other land disturbances that could affect nesting birds (e.g., tree removal, mowing, mastication, brush removal), the construction area shall be surveyed to evaluate the potential for nesting birds. Tree removal will be limited, whenever feasible, based on the presence or absence of nesting birds. For all other construction activities, if birds exhibiting nesting behavior are found within the treatment sites during the bird nesting season (March 15 – August 30 for smaller bird species such as passerines and February 15 - August 30 for raptors) impacts on nesting birds will be avoided by the establishment of appropriate buffers around active nests. The distance of the protective buffers surrounding each active nest site are: 500 feet for large raptors such as buteos, 250 feet for small raptors such as accipiters, and 250 feet for passerines. The size of the buffer may be adjusted by an MROSD biologist in consultation with CDFW and USFWS depending on site specific conditions. Monitoring of the nest by an MROSD biologist during and after construction activities will be required if the activity has potential to adversely affect the nest. Construction may resume in these areas after an MROSD biologist or designated biological monitor confirms that the young have fully fledged, are no longer being fed by the parents, and have left the nest site. For construction activities that clearly would not have adverse impacts to nesting birds (e.g. non-powered hand tool work), no survey for nesting birds would be required.

Special Status Plants

Actions planned under the proposed project, such as roadway erosion and damage repair, and removal and replacement of creek crossings, could result in smothering, compaction of soils, or crushing of root systems of special-status plants. Portions of the project site support suitable habitat for Santa Clara red ribbons, Loma Prieta hoita, woodland woollythreads, Santa Cruz Mountains beardtongue, and white-flowered rein orchid. If these species occur in the vicinity of the project site, individuals could be adversely impacted during project implementation, including mortality of individuals by crushing or habitat destruction. Therefore, the impact is considered *potentially significant*.

Mitigation Measure 3.4-4

MROSD shall implement the following measures to avoid and minimize impacts to special-status plants.

- MROSD shall utilize qualified staff or a contractor to conduct protocol-level preconstruction special-status plant surveys for all potentially occurring species within the project footprint that has not previously been surveyed. Prior to ground-disturbance or vegetation management in potentially suitable habitat, surveys shall be conducted during the appropriate blooming period when they are most readily identifiable in accordance with Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (DFG 2009). If no special-status plants are found during focused surveys, the findings shall be documented in a letter report, and no further mitigation shall be required.

- If special-status plant populations are present in the project footprint, MROSD shall determine if the population can be avoided by adjusting the project design.

- If the impact to special-status plants cannot be avoided, MROSD shall consult with CDFW or USFWS, as appropriate depending on species' status, to determine the appropriate measures to ensure no net loss of occupied habitat or individuals. These measures may include preserving and enhancing existing populations, creation of off-site populations on project mitigation sites through seed collection or transplantation, and/or restoring or creating suitable habitat in sufficient quantities to achieve the no-net-loss standard.

Level of Impact after Implementation of Mitigation Measures

Implementation of Mitigation Measures 3.4-1 through 3.4-4 would reduce impacts to special-status wildlife and plant species by implementing measures that would minimize effects on California red-legged frog, Foothill yellow-legged frog, and nesting birds. San Francisco dusky-footed woodrat houses and the roosts of special status bat species would be avoided. Surveys would be conducted for special-status plants and avoidance and/or compensatory measures would be implemented to minimize potential take of these species or adversely affecting their habitat. This impact would be reduced to a *less-than-significant* level.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?

Less than Significant. Sensitive natural communities are of limited distribution statewide or within a county or region that provide important habitat value to native species. Most types of wetlands and riparian communities are considered sensitive natural communities due to their limited distribution in California. In addition, sensitive natural communities include habitats that are subject to USACE jurisdiction under Section 404 of the Clean Water Act (CWA), Section 1602 of the California Fish and Game Code, and the state's Porter-Cologne Water Quality Control Act. Sensitive natural communities are of special concern because they have high potential to support special-status plant and animal species. Sensitive natural communities can also provide other important ecological functions, such as enhancing flood and erosion control and maintaining water quality.

Sensitive natural communities within the project site include riparian woodland and wetlands. Project improvements, ongoing maintenance, and occasional recreational uses within the project site could adversely affect these sensitive natural communities through vegetation removal, soil compaction, and introduction of invasive weeds. However, very few trees would be removed as part of the project, and because the project is a restoration project that would reduce erosion, restore native topography, and increase the ecological functions and values of the project site, potential impacts to sensitive habitat would be minimized. In addition, the LTMP includes elements and tasks to avoid/reduce long-term impacts on sensitive natural communities including monitoring, adaptive management in areas where habitat degradation is occurring, and management of invasive species. Implementation of these measures would ensure that potential impacts of the proposed project on sensitive natural communities would be *less than significant.*

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Less than Significant with Mitigation Incorporated. Hendrys Creek and associated tributaries on the project site are tributaries to Lexington Reservoir in the Los Gatos Creek watershed (U.S. Geological Survey 1953 cited in MROSD 2012a). Based on the reconnaissance field visits of the project site conducted by Coast Range Biological, LLC, Hendrys Creek has a bed, bank, and ordinary high water mark and would be considered a potential jurisdictional "other waters" by USACE. "Other waters" are seasonal or perennial water bodies, such as lakes, stream channels (including intermittent or ephemeral streams), drainages, ponds, and other surface water features that exhibit an ordinary high water mark but lack positive indicators of one or more of the three wetland parameters (hydrophytic vegetation, wetland hydrology, hydric soils) (Federal Register 1986 cited in MROSD 2012a). Tributaries to Hendrys Creek and seeps located on-site would also be considered waters of the U.S. Construction activities would result in temporary impacts to Hendrys Creek and its tributaries related to removal of creek crossings and sediment. Any activities occurring within jurisdictional waters would be considered a significant impact to waters of the United States.

The LTMP includes numerous actions to protect or improve watershed resources and aquatic habitat in the long term, such as removing road crossings and restoring the creek banks, monitoring erosion, and removal of invasive species. In addition, the project is proposed as mitigation in perpetuity for wetland impacts associated with the SCVWD 2002 Multi-Year SMP. Therefore, the proposed project would not have any long-term impacts to wetlands or waters of the U.S.

Although the project would not result in any long-term impacts to waters of the U.S., the temporary construction-related impacts to waters located on-site would be considered *potentially significant*.

Mitigation Measure 3.4-5

MROSD operates under a special agreement known as "Waste Discharge Requirements and Section 401 Water Quality Certifications for Routine Maintenance Activities (Order No. R2-2010-0083)" with the California Regional Water Quality Control Board. In addition, MROSD holds a similarly-structured agreement known as the Final Lake or Streambed Alteration Agreement (Notification No. 1600-2012-0444-R3) District-wide Routine Maintenance Agreement with the California Department of Fish and Wildlife. A portion of the work proposed under this project will apply under these two permitting authorities and agreements; the remainder of the project work will comply with the following measures to compensate for the temporary loss of wetlands and other waters of the United States:

- MROSD will submit a wetland delineation report to USACE and request a preliminary jurisdictional determination. Based on the jurisdictional determination, MROSD will determine the exact acreage of waters of the U.S. and waters of the state that would be filled as a result of project implementation.

- MROSD will replace on a "no net loss" basis (minimum 1:1 ratio) (in accordance with USACE and/or RWQCB) the acreage and function of all wetlands and other waters that would be removed, lost, or degraded as a result of project implementation. Wetland habitat will be restored on-site as determined during the Section 401 and Section 404 permitting processes.

- MROSD will coordinate with the USACE to obtain either a Nationwide Permit or a USACE Section 404 Permit and RWQCB Section 401 certification before any groundbreaking activity within 50 feet of any wetland or water of the United States. MROSD will implement all permit conditions.

Level of Impact after Implementation of Mitigation Measures

Implementation of Mitigation Measure 3.4-5 would reduce impacts to wetlands and waters of the U.S. by restoring any disturbed areas within the waterways on-site. This impact would be reduced to a *less-than-significant* level.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Less than Significant. Wildlife corridors are features that provide connections between two or more areas of habitat that would otherwise be isolated and unusable. Often drainages, creeks, or riparian areas are used by wildlife as movement corridors as these features can provide cover and access across a landscape.

The project site and surrounding Preserve provide corridors for movement of large wildlife such as deer, mountain lions, and raptors. The project site is linked on all sides to existing open space, park, and watershed lands promoting biological connectivity. The adjoining Preserve contains a wide variety of habitats supporting many wildlife species and contains considerable biodiversity.

The proposed project includes removal of stream crossings and restoration of these areas along Hendrys Creek. Implementation of the proposed project would improve habitat within the project site, and very limited, docent-led public access would be allowed within the property. No actions proposed under the LTMP would fragment interior habitat or impede the movement of wildlife or fish throughout the property. Also, no new lighting is proposed that could inhibit the nocturnal movement of species. Therefore, implementation of the proposed project would result in a *less-than-significant* impact to wildlife corridors.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Less than Significant. The Santa Clara County General Plan includes policies and goals related to protecting biological resources. In addition, the Santa Clara County Tree Preservation and Removal Ordinance (County Code, Sections C16.1 to C16.17) serves to protect all trees measuring 12 inches diameter at breast height. The LTMP would allow removal or trimming of live trees, dead trees, brush, and/or woody debris where required by fire protection agencies, or for treatment of disease, public safety, patrol vehicle access, recreational access; however, the proposed project would be designed to avoid tree removal to the extent possible; as a result, very few trees would be removed. In addition, the measure included in the LTMP and mitigation measures included in this document would minimize potential adverse effects on sensitive habitats to less-than-significant levels. Should such a need arise for a tree to be removed, MROSD would follow Santa Clara County requirements and remain in compliance with local ordinances. Therefore, this impact is considered *less than significant*.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact. The property is not located within the Santa Clara Valley Habitat Plan (which is a Habitat Conservation Plan and Natural Community Conservation Plan) study area and is not subject to an adopted or proposed Habitat Conservation Plan, Natural Community Conservation Plan or other habitat conservation plan. Therefore, *no impact* would occur.

3.5 CULTURAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V. Cultural Resources. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

3.5.1 Environmental Setting

The primary source referenced for this section is the Archaeological Survey Report for Hendrys Creek Property, Sierra Azul Open Space Preserve, Santa Clara County, California prepared by Mark Hylkema MA, RPA (See Appendix C).

Localized environmental conditions within the vicinity of the study area influenced patterns of prehistoric and historic land use, which span the millennia during which the ancestral Ohlone Indians developed, and then on through the early years of Spanish colonization, subsequent Mexican rule, and finally up to contemporary American occupation and the eventual establishment of Lexington Reservoir. A description of this timeline, including brief depictions of the Ohlone lifeways, is provided in the Archaeological Survey Report (ASR) included as Appendix C; the following discussion focuses on the results of the literature search and field visit conducted by Mark Hylkema.

A review of archaeological records was conducted through the Northwest Regional Information Center at Sonoma State University to determine if previously recorded archaeological sites were known to exist within, or adjacent to the project Study Area. The Information Center serves as the regional archive for the State Office of Historic Preservation (OHP) where archaeological records are kept and curated. The record search did not find any previously recorded archaeological sites within a half mile of the study area, although the nearby township of Alma (typically submerged below the waters of Lexington Reservoir) had been surveyed and recorded in 2010 by Cabrillo College when the reservoir had been emptied for reinforcement of the dam.

A review of historic maps resulted in the identification of a structure and road within the study area, established sometime before 1916. The road is likely the same one used today.

A field reconnaissance of the project site was done on October 27, 2014 by Mark Hylkema (MA RPA Archaeologist with 34 years professional experience in California Archaeology), and Dan Cearley (MA Archaeologist with 24 years professional experience).

The project site was mostly too steep to have been likely to exhibit any archaeological resources, and the survey was largely restricted to the stream corridor and terraces immediately adjacent to the stream within the Area of Direct Impact (ADI) for the proposed stream improvements project. (See Appendix C for an exhibit showing the ADI.) A series of project pictures were taken and are presented in Appendix A of the ASR, included as Appendix C of this Initial Study.

Immediately noticeable in the study area were many tiers of graded terraces paralleling the stream corridor. These terraces represent an elaborate system of leveling that was done over the past fifty or so years to make suitable locations for a variety of small houses, shacks and sheds. MROSD staff indicated that the former resident had leased numerous sites for residential use without permits or real concern for the effects to the natural environment. Many terraces were created and some still exhibit stacked stone retaining walls-which held soil for gardens and other domestic, non-native plants. Indeed, the landscape abounds with exotic species like cactus, fruit trees, decorative shrubs, etc. Trash associated with the former residences is still evident throughout the ADI.

None of the former structure site locations could be considered historic or otherwise construed as features of an historic landscape. However, one location of a former structure, referred to here as Feature 1 (see pictures in Appendix A of the ASR—Appendix C of this Initial Study), exhibited fragmented bottles and ceramics that appeared to date to the early 1920s and later (embossed bottles with seams, transfer ware ceramics). Also, stone foundations and the use of lime mortar rather than cement at various places suggest an earlier establishment of Feature 1. Regardless, this feature also evidenced a more contemporary litter of metal and glass, as well as foundation alignments of a much more recent temporal context indicating a general lack of integrity.

A variety of structural and historic debris scattered around the larger graded area that once supported the structure of Feature 1 further confirmed the conclusion that this feature was not worth recording or detailing further in the present ASR. Moreover, the proposed project does not include removal of the remaining traces of Feature 1.

The field survey also found the alignment of a narrow grade that perhaps once functioned as a road or path. Presently, many shrubs and trees grow within its footprint suggesting that it has not been used for many years; however, the sizes of the laurel and scrub oak trees growing in the grade are not older than about fifty years. The road traversed southwest from the junction of Hendrys Creek and Tributary 11, trended upward around the toe of slope, and then after an inclined u-turn it followed a fairly straight course east towards the higher elevation of the ridge separating Hendrys Creek from Hooker Creek to the south. The alignment is outside of the project ADI and does not show up in historic maps. Therefore this potential linear feature is not considered further in the ASR.

3.5.2 Discussion

a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?

Less than Significant. Historical resources include standing buildings (e.g., houses, barns, outbuildings, cabins) and intact structures (e.g., dams, bridges). A significant historical resource is defined as "a resource listed or eligible for listing on the California Register of Historical Resources (CRHR)" (Public Resources Code [PRC] Section 5024.1). A historical resource may be eligible for listing on the CRHR if it:

1. is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; or

2. is associated with the lives of persons important in our past; or

3. embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possess high artistic values; or

4. has yielded, or may be likely to yield, information important in prehistory or history.

Eligibility for listing on the CRHR rests on twin factors of significance and integrity. A property must have both significance and integrity to be considered eligible. Loss of integrity, if sufficiently great, will overwhelm historical significance a property may possess and render it ineligible. Likewise, a property can have complete integrity, but if it lacks significance, it must also be considered ineligible.

There are no standing buildings (houses, barns, outbuildings, or cabins) located on the project site, but there are culverts and creek crossings. Research into the project site did not reveal significant associations with the orchards or ranching development in San Mateo County, any important persons associated with local history, nor any specific history related to the crossings. In addition, the crossings do not embody any distinctive characteristics, as shown by hodge-podge of architecture visible at these crossings; the re-use of older materials (cobbles and wood) contrasts with the mix of modern materials (cement, wood, cinder block, and cement brick). This also shows the crossings have no remaining integrity as they appear to have been modified recently, possibly due to being washed out.

Therefore, the creek crossings do not appear to be eligible for listing in the CRHR and are not considered to be historically significant for the purposes of CEQA. This impact would be *less than significant*.

b, c) Cause a substantial adverse change in the significance of an archaeological or paleontological resource pursuant to Section 15064.5?

Less than Significant with Mitigation Incorporated. As described above under the environmental setting, neither the literature review nor field survey resulted in the identification of significant cultural resources within the study area. Remnants of structural remains, (cement and stone house foundation alignments, gardens, graded surfaces, etc.), lack any historic integrity and do not meet the criteria of significance. The landscape has been severely altered within the past forty years and no longer resembles its original natural or historical setting. The ASR prepared for this project identified negative findings.

Although no archaeological resources were identified in the ASR, the potential exists that unidentified archaeological resources could be discovered during construction. This is considered unlikely due to the level of disturbance of the project site, but damage to an unknown archaeological resources would be a *potentially significant* impact.

Mitigation Measure 3.5-1

In the event that any prehistoric or historic-era subsurface archaeological features or deposits are discovered during construction, all ground-disturbing activity within 100 feet of the find shall be halted and a qualified professional archaeologist shall be retained to assess the significance of the find. If the find is determined to be significant by the qualified archaeologist (i.e., because it is determined to constitute either an historical resource or a unique archaeological resource), the archaeologist shall develop appropriate procedures to protect the integrity of the resource and ensure that no additional resources are affected. Procedures could include but would not necessarily be limited to preservation in place, archival research, subsurface testing, or contiguous block unit excavation and data recovery. If the archaeologist determines that some or all of the affected property qualifies as a Native American Cultural Place, including a Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine (Public Resources Code Section 5097.9) or a Native American historic, cultural, or sacred site, that is listed or may be eligible for listing in the California Register of Historical Resources pursuant to Public Resources Code Section 5024.1, the archaeologist shall recommend, and MROSD shall implement, potentially feasible procedures that would preserve the integrity of the site or minimize impacts on it.

Significance after Mitigation

Implementation of this Mitigation Measure would require the performance of professionally accepted and legally compliant procedures for the discovery of archaeological and paleontological resources and would, therefore, reduce this impact to a *less-than-significant* level.

d) Disturb any human remains, including those interred outside of formal cemeteries?

Less than Significant with Mitigation Incorporated. Based on the documentary research described above, no evidence suggests that any prehistoric or historic-era marked or un-marked human interments are present within or in the immediate vicinity of the project site. However, there is a possibility that unmarked, previously unknown Native American or other graves could be present and could be uncovered during construction activities. California law recognizes the need to protect historic-era and Native American human burials, skeletal remains, and grave-associated items from vandalism and inadvertent destruction and any substantial change to or destruction of these resources would be a *potentially significant* impact.

Mitigation Measure 3.5-2

In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, the foreman shall immediately halt potentially damaging excavation in the area of the burial and notify the County Coroner and a professional archaeologist to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). Following the coroner's findings, the archaeologist, and the NAHC-designated Most Likely Descendent shall determine the ultimate treatment and disposition of the remains and take appropriate steps to ensure that additional human interments are not disturbed. The responsibilities for acting upon notification of a discovery of Native American human remains are identified in California Public Resources Code Section 5097.94.

Significance after Mitigation

Implementation of this Mitigation Measure would require the performance of professionally accepted and legally compliant procedures for the discovery of human remains and would, therefore, reduce this impact to a *less-than-significant* level.

3.6 GEOLOGY AND SOILS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VI. Geology and Soils. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to California Geological Survey Special Publication 42.)	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

3.6.1 Environmental Setting

The project site is within the central portion of the Coast Ranges Province of California, which is a series of coastal mountain chains dominated by a central northwest-southeast ridgeline. The project site lies on the northeastern flank of the rural Santa Cruz Mountains between Santa Clara Valley and Monterey Bay. The Santa Cruz Mountain terrain is variable and consists of rounded ridge crests with steep-sided slopes and deeply incised, V-shaped valleys. Topography within the property is characterized by steep north and south facing slopes that form Hendrys Creek canyon, with elevations ranging from approximately 800 feet to 2,600 feet (MROSD 2012b).

The project site is located within a seismically active area. The San Andreas Fault Zone is located less than 1 mile southwest of the project site. The San Andreas Fault is capable of generating a Maximum Moment Magnitude 7.9 earthquake with a recurrence interval of roughly 210 years (Petersen et al. 1996 in MROSD 2012b). Surface rupture along this segment of the fault occurred in both the 1906 San Francisco and 1989

Loma Prieta earthquakes (Wiegers and Clahan 2002 in MROSD 2012b). Uplift along the San Andreas and associated faults are responsible for the high, rugged topography of the project vicinity. The north uppermost slopes of the watershed are prone to landslides, resulting in thin soils with little capacity to hold water (MROSD 2012b).

Geology of the area is dominated by rocks from the Cretaceous and Jurassic Age Franciscan Complex (McLaughlin et al. 2001). The main stem of Hendrys Creek is Pleistocene and Holocene stream and fan deposits consisting of unconsolidated sand, gravel, and boulders. The valley bottom is formed by a series of discontinuous fluvial terraces (MROSD 2012b).

Soil types found within and adjacent to the project site include the Mouser-Katykat-Sanikara complex, 50 to 75 percent slopes; Sanikara-Mouser-Rock complex, 50 to 75 percent slopes; and Sanikara-Rock Outcrop complex, 75 to 100 percent slopes (NRCS 2013). All three soil types are well-drained and typically found on mountain slopes. The Mouser-Katykat-Sanikara is derived from sandstone colluvium over residuum and has a loam texture in the upper 24 inches. The Sanikara-Mouser-Rock is cobbly-loam textured in the upper 12 inches, and bedrock below 12 inches, and the Sanikara Outcrop soil is gravelly coarse sandy loam and very gravelly sandy loam textured in the upper 13 inches, with bedrock present below 13 inches (MROSD 2012a).

3.6.2 Discussion

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to California Geological Survey Special Publication 42.)

Less than Significant. The project site is located within a seismically active area, and is less than 1 mile from the San Andreas Fault Zone. However, the proposed project would permanently preserve the project site as open space, and existing road crossings would be removed or replaced. No additional structures would be developed as part of the proposed project. Public access to the project site would be limited by MROSD, with permits granted on a case-by-case basis and periodic staff-led tours. Visitors would be outside and would not typically be directly exposed to risk from rupture of an earthquake fault. This impact would be *less than significant*.

Note that visitors may be subject to indirect events induced by fault rupture, most notably landslides. Risk to visitors from landslides is discussed below under "iv."

ii) Strong seismic ground shaking?

Less than Significant. As indicated above under "i," the proposed project would include the removal or replacement of road crossings and would not include any habitable structures. Public access to the project site would be "permit only," and visitors would be relatively unexposed to hazards associated with seismic ground shaking. The impact would be *less than significant*.

iii) Seismic-related ground failure, including liquefaction?

Less than Significant. Although the proposed project is in a seismically active location, liquefaction and other seismic-related ground failure primarily affect structures. Because there are currently no structures on-site, and the proposed project would not result in construction of any new structures, impacts related to liquefaction would be *less than significant*.

iv) Landslides?

Less than Significant. The Hendrys Creek tributaries drain narrow and steep gradient watersheds, and the north uppermost slopes of the watershed are prone to landslides. These existing and potential new landslides are subject to accelerated soil erosion. The project site is located on the low-gradient depositional reach of Hendrys Creek, and is therefore more likely to be the location where the stream's natural sediment and debris load is deposited. Debris fans have formed at the mouths of these drainages from naturally high sediment loads and infrequent debris flow landslides that extend down the tributary channel.

Landslides are likely to continue on the property in the future regardless of any rehabilitation work or land management that occurs on the project site. However, the proposed project would include replacement of existing creek crossings and would not include construction of any new structures on site, and permit-only access would be allowed within the property. Therefore, because the proposed project would not increase the exposure of people or structures to landslides, this impact would be *less-than-significant*.

b) Result in substantial soil erosion or the loss of topsoil?

Less than Significant. The project site is located in the moderately steep to very steep hills of the Santa Cruz Mountains. The north uppermost slopes of the watershed are prone to landslides, and these existing and potential new landslides are subject to accelerated soil erosion. Grading associated with construction could also temporarily increase erosion at localized locations within property. However, implementation of the proposed project would include removal of stream crossings that are currently causing erosion and reshaping the crossings so that regular maintenance is no longer needed and future erosion is largely prevented. During the second phase of the project, concentrated efforts would also be made to control stream erosion. In addition, there are currently District-wide requirements in place to protect water quality during maintenance activities. As outlined in MROSD's *Best Management Practices and Standard Operating Procedures for Routine Maintenance Activities in Water Courses* (see Appendix D), which has been reviewed and approved by the RWQCB and CDFW, MROSD follows specifications and guidelines designed to protect water quality. Additionally, maintenance work in watercourses will meet standards and be consistent with the current RWQCB Memorandum of Understanding for routine maintenance activities on MROSD lands. These standards would be followed, as applicable, based on site conditions and specific project requirements.

Because MROSD would implement the above-described measures to reduce soil erosion and implementation of the project would reduce erosion in the long-term, impacts associated with erosion would be *less-than-significant* with implementation of the proposed project.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

Less than Significant. Generally, impacts associated with unstable soils relate to potential damage to structures. The proposed project would remove or replace existing creek crossing and would not develop any new structures. Therefore, no structures would be affected by unstable soils. Landslide-related hazards associated with proposed public access are addressed under "a-iv" above. Project-related impacts related to unstable soils would be *less than significant*.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial risks to life or property?

Less than Significant. Similar to the discussion under "c" above, substantial risk to life or property would generally occur to habitable buildings, which could experience compromised structural integrity due to expansive soils. The proposed project would include removal or replacement of creek crossings and would not include construction of any new structures. Therefore, similar to "c" above, the impact would be *less than significant*.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No Impact. All septic tanks have been removed from the project site and the proposed project would not include any new restrooms and would therefore not require any septic system or other form of waste water disposal. *No impact* would result.

3.7 GREENHOUSE GAS EMISSIONS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. Greenhouse Gas Emissions. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

3.7.1 Environmental Setting

Certain gases in the earth's atmosphere, classified as greenhouse gases (GHGs), play a critical role in determining the earth's surface temperature. GHGs are responsible for "trapping" solar radiation in the earth's atmosphere, a phenomenon known as the greenhouse effect. Prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for intensifying the greenhouse effect and have led to a trend of unnatural warming of the earth's climate, known as global climate change or global warming. It is extremely unlikely that global climate change of the past 50 years can be explained without the contribution from human activities (Intergovernmental Panel on Climate Change [IPCC] 2007). By adoption of AB 32, the California Global Warming Solutions Act of 2006, and Senate Bill (SB) 97, the State of California has acknowledged that the effects of GHG emissions cause adverse environmental impacts.

Emissions of GHGs have the potential to adversely affect the environment because such emissions contribute, on a cumulative basis, to global climate change. Although the emissions of one single project will not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative impact with respect to global climate change.

Legislation and executive orders on the subject of climate change in California have established a statewide context and a process for developing an enforceable statewide cap on GHG emissions. Given the nature of environmental consequences from GHGs and global climate change, CEQA requires that lead agencies consider evaluating the cumulative impacts of GHGs, even relatively small (on a global basis) additions. Small contributions to this cumulative impact (from which significant effects are occurring and are expected to worsen over time) may be potentially considerable and therefore significant.

Therefore, the global climate change analysis presented in this section estimates and analyzes the GHG emissions associated with construction- and operations-related activities that would occur under the proposed LTMP for the Hendrys Creek property.

The BAAQMD is the local agency overseeing air quality considerations in Santa Clara County. On June 2, 2010, the BAAQMD adopted new CEQA significance thresholds including a threshold for GHGs of 1,100 metric tons of CO_2 equivalent per year (MT CO_2e/yr) for evaluating operation-related emissions (BAAQMD 2010). This threshold was designed to establish the mass emissions level at which a project's contribution would be considered a significant environmental impact under CEQA. The threshold was developed based on overall projections of development in the region, and how the region would come into compliance with the goals established by AB 32.

On March 5, 2012, the Alameda County Superior Court issued a judgment finding that the BAAQMD had failed to comply with CEQA when it adopted these thresholds. The court did not determine whether the thresholds were valid on the merits, but rather found that the adoption of the thresholds was a project under CEQA. The court issued a writ of mandate ordering the BAAQMD to set aside the thresholds and cease their dissemination until the BAAQMD had complied with CEQA.

CEQA gives lead agencies discretion whether or not to classify a particular environmental impact as significant. Ultimately, formulation of a standard or "threshold" of significance requires the lead agency to make a policy judgment about where the line should be drawn distinguishing adverse impacts it considers significant from those that are not deemed significant. This judgment must, however, be based on scientific information and other factual data to the extent possible (State CEQA Guidelines Section 15064[b]).

Although the Alameda County Superior Court has ordered the BAAQMD to cease dissemination of the previously adopted threshold of 1,100 MT CO_2e/yr, the court has made no finding on the applicability or the merits of the quantitative threshold. BAAQMD states that lead agencies will need to determine appropriate air quality thresholds to use for each project they review based on substantial evidence that they should include in the administrative record for the project. One resource BAAQMD provides as a reference for determining appropriate thresholds is the CEQA Thresholds Options and Justification Report developed by staff in 2009 (BAAQMD 2009). The CEQA Thresholds Options and Justification Report outlines substantial evidence supporting a variety of thresholds of significance.

Therefore, because the proposed project would result emissions of GHGs from construction and regular maintenance, and is located within the BAAQMD's jurisdiction for which these thresholds were determined to be applicable, MROSD considers the threshold of 1,100 MT CO_2e/yr to be an acceptable threshold for CEQA significance with regards to GHG emissions.

3.7.2 Discussion

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Less than Significant. Implementation of the proposed project would not result in a noticeable increase in visitation. Any additional vehicle trips generated during operation of the project would be negligible. Therefore, greenhouse gas emissions associated with increased vehicle trips would be minimal. Proposed construction activities include limited heavy construction equipment associated primarily with the removal of stream crossings and other creek restoration activities. To estimate GHG emissions, GHG modeling was conducted using the BAAQMD-approved California Emissions Estimator Model, Version 2001.1.1 (CalEEMod). A summary of estimated GHG emissions is provided below in Table 3.7-1.

Based on the modeling conducted, project-related activities would result in 36 MT per year (MT/year) of CO_2e emissions. These emissions levels would be less than BAAQMD's threshold of significance of 1,100 MT/year. Thus, project-generated emissions would not result in a cumulatively considerable net increase of GHGs. As a result, this impact would be *less than significant*.

Table 3.7-1 Summary of Estimated Emissions of Carbon Dioxide Equivalent Associated with Project-Related Activities (MT CO_2e/year)

Construction-Related Activities (average annual)	36
Operations (mobile- and area sources, energy use)	–
Total	36
BAAQMD Threshold of Significance	1,100

Notes: MT/year = metric tons per year; CO_2e = carbon dioxide-equivalent
Detailed assumptions and modeling output files are included in Appendix B, including construction and methane emissions from cattle.
Any emissions from vehicle trips and power usage would be negligible and therefore were not modeled.
Emissions associated with construction activities were estimated using the BAAQMD-approved CalEEMod model.

Source: Modeling Conducted by Ascent Environmental 2014.

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Less than Significant. As discussed under item a) above, the total GHG emissions associated with the proposed project would be less than BAAQMD's threshold of 1,100 MT/year. Because BAAQMD's threshold is based on the emissions reduction targets established by AB 32 for the year 2020 project-generated GHG emissions would not conflict with any other applicable plans, policies, or regulations established for the purposes of reducing GHG emissions. Therefore, this impact would be *less than significant*.

3.8 HAZARDS AND HAZARDOUS MATERIALS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII. Hazards and Hazardous Materials. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☒	☐	☐

3.8.1 Environmental Setting

During the purchase of the property, POST, the previous property owner, contracted with an environmental firm to prepare a Phase I Environmental Site Assessment (ESA). The Phase I ESA identified the use of significant quantities of hazardous substances at properties in the project vicinity; however, no use, storage, disposal, or release of hazardous substances were identified within the project site. The Lupin Naturalist Club (located outside the project site property) had one 520-gallon underground storage tank that resulted in soil contamination. A soil and groundwater investigation plan was produced in December 1999 and the County of Santa Clara granted a Complete-Case Closed on July 2001 for this site. Because this release was limited to soils and based on its position relative to the project site, it is unlikely this former site affected the property (DGC 2011).

Wildfire has had an important role on the natural communities within Hendrys Creek watershed and the surrounding Los Gatos Creek watershed including a July 1985 wildfire that burned 22 square miles between Lexington Reservoir and Loma Prieta. This fire also burned much of the upper hillsides along the northern portion of the project site. This portion of the project site, as well as much of the upper Los Gatos Creek watershed, is undergoing regeneration and forest succession from this fire and other major past disturbances. The project site is within the designated Wildfire and Urban Interface Fire Area with a fire hazard zone classification of very high.

There are no schools within 0.25 mile of the project site and the project site is not within 2 miles of an airport or private airstrip.

3.8.2 Discussion

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Less than Significant. MROSD Ordinance 93-1, Section 409.2 prohibits the general public from possessing or using harmful substances on MROSD lands. The proposed project does not include routine use of hazardous materials on the project site with the exception of small quantities of common household hazardous materials such as pesticides, fuels, oils, lubricants, solvents, and detergents. A controlled amount of pesticides would occasionally be applied to control invasive weeds. Pesticide applications would comply with label instructions and all applicable local, state, and federal regulations. Implementation of the proposed LTMP would not pose a significant hazard to the public or the environment. This impact is *less than significant*.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?

Less than Significant. As discussed under "a" above, no hazardous materials were found on-site during the Phase 1 ESA, and all structures, personal property, and debris were removed prior to POST's purchase of the property, with the exception of a network of roads and driveways, two vehicle bridges, several culverted road/stream crossings, and a pedestrian bridge. Therefore, the proposed project would not involve the demolition or removal of any structures that contain hazardous materials. Public access within the project site would be limited to hiking (by permit only), which is a low-intensity, non-motorized, and non-emitting use, and would primarily be led by MROSD docents. The possibility of the incidental release of motor vehicle oil, grease, or fuel is therefore limited to the infrequent use of roads by MROSD patrol and maintenance vehicles, occasional emergency responders, and vehicles and machinery used during the temporary construction process. Any release of minor amounts of hazardous material resulting from the limited vehicular use does not pose a significant hazard to the public. This impact would be *less than significant*.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

No Impact. As discussed under "a" above, the proposed project would not result in the use, transport, or disposal of substantial hazardous materials. In addition, the project site is not located within one-quarter mile of an existing or proposed school. The nearest school is Lexington Elementary School, more than 1.5 miles north of the project site boundary. *No impact* would occur.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Less than Significant. The Hazardous Waste and Substances Sites (Cortese) List is a planning document used by the State, local agencies, and developers to comply with the CEQA requirements in providing information about the location of hazardous materials release sites. Government Code section 65962.5 requires the California Environmental Protection Agency to develop at least annually an updated Cortese List. California Department of Toxic Substances Control (DTSC) is responsible for a portion of the information contained in the Cortese List. Other State and local government agencies are required to provide additional hazardous material release information for the Cortese List. DTSC's EnviroStor database provides DTSC's component of Cortese List data.

The 2011 Phase I ESA included a review of a regulatory agency database report prepared for the project site, which indicated that no records of any hazardous materials were identified for the project site. The search of California Department of Oil, Gas, and Geothermal Resources well records on-line indicates that no oil and gas wells are located on the project site (DGC 2011). The proposed project site is not identified on the Cortese list or other State and county hazardous materials lists; therefore, this impact would be *less than significant*.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

No Impact. The project site is not located within 2 miles of a public airport and is not located within an airport land use plan. *No impact* would occur.

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact. The project site is not located within 2 miles of a private airstrip; therefore, construction and implementation of the project would not result in a safety hazard to people residing or working in the area. *No impact* would occur.

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

No Impact. There are no adopted emergency response plans or emergency evacuation plans affecting the project site. The proposed project includes very limited, permit-only public access for recreation. No structures are proposed, and no public vehicle access is proposed. The proposed project would provide appropriate emergency vehicle access. Therefore, implementation of the proposed project would not interfere with an adopted emergency response plan or emergency evacuation plan. The proposed project would therefore result in *no impact* to emergency response plans or emergency evacuation plans. See Section 3.16, Public Services for more detailed discussion regarding emergency response.

h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

Less than Significant with Mitigation Incorporated. The proposed project would decrease risk of wildland fire due to the vegetation and invasive weed management on the property, which would reduce on-site fuels by controlling vegetation during the fire season. In addition, no new structures are proposed on-site and public access to the property would be permit-only and therefore very limited.

While fire protection within current MROSD boundaries is provided by the jurisdictional local fire departments and CAL FIRE, MROSD works cooperatively with these jurisdictional fire agencies to reduce fire risk by assisting them to respond quickly and effectively to wildland fires. MROSD maintains fire breaks to slow or arrest the spread of wildland fires, and a system of MROSD-maintained fire roads ensures adequate access to remote areas. MROSD lands are patrolled routinely by trained staff members in vehicles equipped with wildland fire suppression equipment, providing first response assistance until the jurisdictional fire agencies arrive and take over the scene.

MROSD Ordinance 93-1 Section 404 prohibits fires and smoking on MROSD lands. In addition, MROSD Rangers will regularly patrol the project site and are trained and equipped for initial response in the Incident Command System for fire suppression, assisting with the response of jurisdictional fire agencies to the scene of a fire. MROSD's radio and repeater system combined with ranger patrols and staff on call 24 hours per day enables prompt and effective communication with emergency service providers in the event of a wildland fire or emergency response call.

Although these measures would be taken to reduce the potential for wildfires on-site, the project site is within the designated Wildfire and Urban Interface Fire Area with a fire hazard zone classification of very high. Therefore, this impact would be *potentially significant*.

Mitigation Measure 3.8-1

To further reduce the potential for wildland fire ignition, the following additional mitigation measure is required:

- To reduce fire ignition risk, MROSD currently requires the following measures for all maintenance and construction activities:
  - All equipment to be used during construction and maintenance activities must have an approved spark arrestor.
  - Grass and fuels around construction sites where construction vehicles are allowed to be parked will be cut or reduced.
  - Mechanical construction equipment that can cause an ignition will not be used when the National Weather Service issues a Red Flag Warning for the San Francisco Bay Area.
  - Hired contractors shall be required to:
    - Provide water and/or fire extinguisher to suppress potential fires caused by the work performed.
    - Remind workers that smoking is prohibited at the work site and on any MROSD land per contract conditions and MROSD Ordinance.
    - Maintain working ABC fire extinguishers on all vehicles in the work area.

Level of Impact after Implementation of Mitigation Measures

Implementation of Mitigation Measure 3.8-1 would reduce construction-related wildfire impacts by requiring fire prevention measures for construction equipment and construction workers to reduce the potential for ignition and spread of fire. This impact would be reduced to a *less-than-significant* level.

3.9 HYDROLOGY AND WATER QUALITY

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IX. Hydrology and Water Quality. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial on- or off-site erosion or siltation?	☐	☐	☒	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or off-site flooding?	☐	☐	☒	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
j) Result in inundation by seiche, tsunami, or mudflow?	☐	☐	☒	☐

3.9.1 Environmental Setting

The project site is within the Los Gatos Creek watershed, which is one of the largest watersheds in Santa Clara County, draining 55 square miles. Los Gatos Creek starts from the headwaters and small tributaries northwest of Loma Prieta Peak and then flows northwest collecting flows from various smaller tributaries until flowing into Lake Elsman. It then continues to the northwest where it joins Hendrys Creek at the upstream end of Lexington Reservoir.

Hendrys Creek and its tributaries are the primary hydrologic features within the project site. Hendrys Creek is a spring-fed perennial creek that flows from the Preserve into Lexington Reservoir and drains an approximately 710-acre watershed. There are approximately nine tributaries to Hendrys Creek within the project site that are characterized as ephemeral streams ranging from 2 to 5 feet wide. Many of the tributaries are draining steep slopes and are experiencing erosion and sedimentation. Most of the tributaries have culvert crossings that are in poor condition or have failed (MROSD 2012b). The project site also contains numerous seeps and springs. No ponds are present within the project site; however, two small instream ponds are found downstream on the adjacent private property. These off-site ponds are owned and managed by Lupin Naturalist Lodge and San Jose Water Company.

The creek hydrology on-site is primarily driven by seasonal surface runoff, and the extensive network of groundwater seeps and springs. Most of the rainfall in this region occurs from November to April with the majority occurring between January and March. Average annual rainfall ranges from 60 inches on the peaks and ridges of the region to 47 inches in the stream and creek valleys. The intense rainfall, thin soils, and steep topography of this region result in a high volume of runoff within short periods of time that can result in erosion and water quality degradation. No impervious surfaces exist within or upstream of the project site; however, existing unpaved roads and road crossings that are in poor condition are contributing to erosion along the waterways within the project site.

Los Gatos Creek has been classified as an impaired water body due to diazinon from urban/stormwater runoff by the San Francisco RWQCB's 303(d) List of Impaired Water Bodies in the San Francisco Bay Region. No other waterways within the project site are listed as Impaired Water Bodies.

3.9.2 Discussion

a) Violate any water quality standards or waste discharge requirements?

Less than Significant. As discussed in the Environmental Setting above, there are erosion and sedimentation issues on the project site associated with several creek crossings. The proposed project would remove the existing failed crossings, excavate residual fill material, and regrade the crossing sites to reduce erosion and sedimentation, improve storm water drainage patterns, reduce drainage concentration on roads, and reduce immediate storm flow diversion potential. MROSD would also implement BMPs as part of the LTMP, such as soil stabilization, minimization of stream bank disturbance, and materials storage area stabilization, to further reduce short- and long-term erosion and water quality impacts.

In addition to these BMPs, runoff water quality is regulated by the National Pollution Discharge Elimination System (NPDES) Program (established through the federal CWA). The NPDES program objective is to control and reduce pollutant discharges to surface water bodies. Compliance with NPDES permits is mandated by State and federal statutes and regulations. Locally, the NPDES Program is administered by the RWQCB. According to the water quality control plans of the RWQCB, any construction activities, including grading, that would result in the disturbance of 1 acre or more would require compliance with the General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activity (Construction General Permit). The project includes a total disturbance area of approximately 11.3 acres and would be subject to compliance with the Construction General Permit.

Current District-wide requirements protect water quality during maintenance activities. As outlined in MROSD's *Best Management Practices and Standard Operating Procedures for Routine Maintenance Activities in Water Courses* (Appendix D), which has been reviewed and approved by the RWQCB and CDFW, MROSD follows specifications and guidelines designed to protect water quality. Additionally, maintenance work in watercourses will meet standards and be consistent with the current RWQCB Memorandum of

Understanding for routine maintenance activities on MROSD lands. These standards would be followed, as applicable, based on site conditions and specific project requirements.

In addition, no public vehicle access would be allowed, and only limited permit-only public access would be allowed on-site. Therefore, there would be no additional erosion caused by the public's use of on-site roads.

Because BMPs would be used to minimize short-term construction-related impacts to water quality and the proposed project would result in a long-term beneficial effect on water quality, this impact would be *less than significant*.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?

Less than Significant. The proposed project does not involve groundwater pumping or interference with groundwater recharge. There would be no long-term water usage associated with the proposed project, and impervious surfaces would not be added to the project site. Therefore, groundwater recharge would not be adversely affected by the proposed project. Impacts associated with groundwater depletion and recharge would be *less than significant*.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial on- or off-site erosion or siltation?

Less than Significant. Overall, the proposed project seeks to maintain and improve the existing drainage patterns on the project site, and impervious surfaces would not be added to the project site. Therefore, the rate of runoff would not increase. As described under "a" above, the proposed project includes measures to remove existing creek crossings, excavate residual fill material, and regrade crossing sites to improve storm water drainage patterns, reduce drainage concentration on roads, and reduce immediate storm flow diversion potential. Removal of sediment from Hendrys Creek and its tributaries would occur during the dry season and would be used as part of the creek and upland restoration. Therefore, the proposed project would improve drainage on-site, and would not substantially increase the rate or amount of surface runoff such that on- or off-site erosion or siltation would occur. This impact would be less than significant.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or off-site flooding?

Less than Significant. Impervious surfaces would not be added to the project site; therefore, the rate of runoff would not increase. In addition, the proposed project would maintain and improve the existing on-site drainage patterns. As described under "a" above, the proposed project includes measures to remove the existing failed crossings, excavate residual fill material, and regrade crossing sites to improve storm water drainage patterns, and reduce immediate storm flow diversion potential. The proposed project would improve the drainage and removal of sediment would improve conveyance of the waterways on-site. Therefore, the project would not substantially increase the rate or amount of surface runoff such that on- or off-site flooding would occur. This impact would be *less than significant*.

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Less than Significant. The proposed project would not adversely affect the drainage patterns or rate of runoff on the project site because the project seeks to maintain or improve the existing drainage patterns. As described under "a" above, the proposed project incorporates measures to improve drainage on-site.

Therefore, the proposed project would not substantially increase the rate or amount of surface runoff such that exceedance of drainage system capacity would occur. This impact would be *less than significant*.

f) Otherwise substantially degrade water quality?

Less than Significant. Non-point source pollution results from land use practices where waste is not collected and disposed of in some identifiable manner. Non-point sources of pollution include: urban drainage, agricultural runoff, road construction activities, mining, grassland management, logging and other harvest activities, and natural sources such as fires, floods, and landslides.

As mentioned above under Environmental Setting, the project site is located within the Los Gatos Creek watershed, and Los Gatos Creek has been classified as an impaired water body due to diazinon from urban/stormwater runoff. Although the proposed restoration, removal of creek crossings, and limited, permit-only public access would not adversely affect long-term water quality within the watershed, construction of the proposed project has the potential to result in temporary degradation of water quality. However, as discussed under "a" above, MROSD would also implement BMPs as part of the LTMP to further reduce short- and long-term erosion and water quality impacts. The proposed project would also be required to obtain a NPDES permit to reduce pollutants associated with construction of the project.

Implementation of these project measures and BMPs would minimize the potential for water quality on the project site to be degraded. The impact would be *less than significant*.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No Impact. The proposed project does not include any new housing or other structures. Furthermore, the lowest portion of the project site is 720 feet above sea level, and is not located within or near a flood zone. Therefore, there would be *no impact* related to flood hazards and housing.

h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?

No Impact. As indicated under "g" above, the proposed project does not include any structures and the project site is not located within the 100-year flood zone. Therefore there would be *no impact* associated with impeding or redirecting flood flows.

i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?

Less than Significant. No new structures would be constructed on-site, and public access would be limited by MROSD, with permits granted on a case-by-case basis and periodic staff-led tours. In addition, staff would not typically access the project site during a heavy storm event. Impacts from exposure to flooding would be *less than significant*.

j) Result in inundation by seiche, tsunami, or mudflow?

Less than Significant. The project site is more than 700 feet above sea level at its lowest point. Seiche or tsunamis from the Pacific Ocean are located too far away to impact the site. The soil conditions and potential for prolonged rain events have the potential to produce mudflows. A mudflow could expose MROSD personnel or members of the general public to potentially life threatening situations if they were present while a mudflow event occurred. However, because of the low probability of such an event and the limited likelihood of MROSD personnel or the public to be in harm's way during an intense storm necessary to precipitate such an event would reduce this potential impact to a *less-than-significant* level.

3.10 LAND USE AND PLANNING

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
X. Land Use and Planning. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

3.10.1 Environmental Setting

The project site is located in the rural western portion of unincorporated Santa Clara County in the Santa Cruz Mountains. Prior to purchase of the property by POST, the project site was privately owned and numerous level pads and road networks were created and graded by the previous owner for small home sites, recreational vehicle trailers, and a 1-acre golf green. Currently, the only access to the site is by MROSD staff and occasional trespassers. All structures, septic tanks, personal property, and debris were removed prior to POST's purchase of the property, with the exception of a network of roads and driveways, two vehicle bridges, several culverted road/stream crossings, and a pedestrian bridge.

The Santa Clara County General Plan designates the property as Hillside, which allows for agricultural uses, mineral extraction, low-density recreation, land in its natural state, wildlife refuges, very low density residential development, and commercial, industrial, or industrial uses that require remote settings or support recreation or appreciation of the natural environment. The Santa Clara County General Plan also includes development policies for any new development in the Los Gatos Watershed (Santa Clara County 1994). The project site is zoned HS (Hillside), requiring a 20- to 160-acre minimum lot size. This zoning designation provides for preserving mountainous lands in open space. The property consists of three parcels that are 78 acres, 38 acres, and a one- acre legal-nonconforming parcel, respectively.

There are currently two easements for the Hendrys Creek property including: a public easement for navigation and the incidents of navigation such as boating, fishing, swimming, and other recreational uses in Hendrys Creek and Frenchman's Creek (See Tributary 11 on Exhibit 2-4), and an easement for ingress and egress and public utilities from Alma Road, a public road, to and through the Hendrys Creek property.

Adjacent land uses in the Hendrys Creek watershed consists predominantly of rural residential, recreational, and open-space uses. There is no established residential community located within the immediate vicinity of the project site. The surrounding area is sparsely populated, with a few residences located along Soda Springs Road, Weaver Road, and Aldercroft Heights Road in the upper watershed. The adjoining private property to the west is owned by Lupin Naturalist Lodge, which currently has approximately 50 residents.

3.10.2 Discussion

a) Physically divide an established community?

No Impact. There are no structures on the project site; therefore, no established community exists within the immediate vicinity of the proposed improvements. The community of Los Gatos is located approximately 8 miles north of the project site. Because the proposed project would be an extension of an existing open space preserve, and is located in a rural area used primarily for agriculture, grazing, and open space uses, the proposed project would not divide an established community. Therefore, there would be *no impact*.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less than Significant. As indicated above under "Environmental Setting," the Santa Clara County General Plan designates the project site as Hillside, which allows for low-density recreation, land in its natural state, and wildlife refuges. The project site is also zoned as HS (Hillside). This zoning designation provides for preserving mountainous lands in open space. The overall goal of the LTMP is to foster the viability of the Waters of the U.S/State, native vegetation, habitats, and connectivity within the project site. Implementation of the proposed project would not conflict with the County's land use designation and zoning for the project site. Therefore, the proposed project would have a *less-than-significant impact* on applicable land use plans, policies or regulations.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact. The proposed project does not contain areas subject to a habitat conservation plan or natural community conservation plan. *No impact* would result.

3.11 MINERAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. Mineral Resources. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

3.11.1 Environmental Setting

According to the Santa Clara County General Plan EIR, there are a number of mineral resource deposits in Santa Clara County that are of regional or state-wide significance, and eight of those deposits are currently being quarried (Santa Clara County 1994). However, none of these sites are located within the project site.

3.11.2 Discussion

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact. The Santa Clara County General Plan EIR identifies eight mineral deposits within the county that are of regional or state-wide significance; however, none of these sites are within the project site. In addition, removal of the road crossings within the site would not result in the loss of any known mineral resources, or preclude future access to any mineral resources. Therefore, there would be *no impact*.

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

No Impact. There are no known mineral resource recovery sites within the project site. As discussed under "a" above, the proposed project would result in the loss of or preclude future access to any mineral resources. Therefore, there would be *no impact*.

3.12 NOISE

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XII. Noise. Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards?	☐	☐	☒	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

3.12.1 Environmental Setting

Existing noise conditions are governed by the presence of noise-sensitive receptors, the location and type of noise sources, and overall ambient noise levels. Noise-sensitive land uses are generally considered to consist of those uses where noise exposure could result in health-related risks to individuals, as well as places where a quiet setting is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional parks and recreation areas are also generally considered sensitive to increases in exterior noise levels. These noise-sensitive land uses are also considered vibration- sensitive.

The project site is located east of Lexington Reservoir, within unincorporated Santa Clara County (see Exhibit 2-2). The project site lies is located along the northeast side of the Santa Cruz Mountains between Santa Clara Valley and Monterey Bay.

There are no sensitive receptors located within the project site. The property is bounded by the Preserve to the north, south, and east, and private property to the west and along its southeastern corner. The nearest offsite sensitive receptors include rural residences located over 1,000 feet from the project disturbance area and Lupin Naturalist Lodge located approximately 0.3 mile to the west (see Exhibit 3.12-1).

Noise sources that may contribute to the existing noise environment consist of aircraft flyover and natural sounds such as leaves rustling and birds chirping.

Created By: mchilds Path: G:\Projects\Sierra_Azul\HendrysCreek\CEQA\Exhibit_2-7_Sensitive_Receptor_Map.mxd

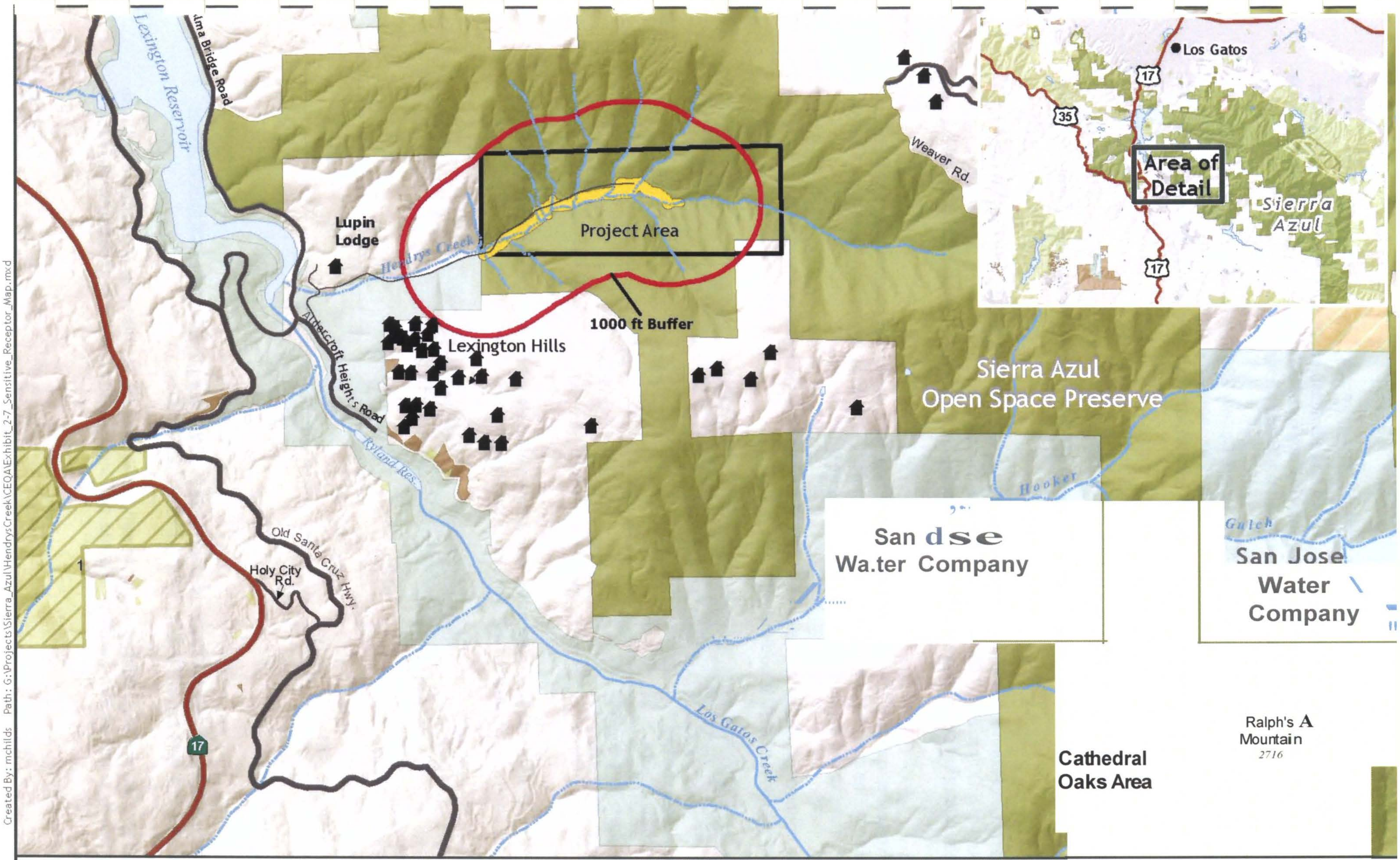


Exhibit 3.12-1

Sensitive Receptor Locations

● Residence Locations

1000 ft Buffer Around Project Area

— Hendrys Creek Property

— MROSD Preserves

Land Trust

Watershed Land

— Other Public Agency

Other Protected Open Space or Park Lands

MROSD Conservation or Agricultural Easement

Non MROSD Conservation or Agricultural Easement

Private Property

Midpeninsula Regional Open Space District (MROSD)

March, 2015

Miles 0 0.25

While the District strives to use the best available digital data, this data does not represent a legal survey and is merely a graphic illustration of geographic features.

The County of Santa Clara has established noise guidelines and standards to protect citizens from potential hearing damage and other adverse physiological and social effects associated with noise. Applicable policies and regulations are contained in the Santa Clara County Zoning Regulations.

The Santa Clara Countywide Airport Land Use Plan (Santa Clara County 2008) describes the five airports within the County: Palo Alto, Reid Hillview, and South County (all general aviation airports), Moffett Field (military airport), and San Jose International Airport. All of these airports are over 10 miles from the project site.

COUNTY OF SANTA CLARA ZONING REGULATIONS

The Santa Clara County Noise Ordinance (Chapter VIII: Control of Noise and Vibration) contains the following applicable provisions:

> Construction noise is exempt from Exterior Noise standards, except for work between weekday and Saturday hours of 7:00 pm and 7:00 am, or any time on Sundays or holidays, such that the sound creates a noise disturbance across a residential or commercial property line. (Sec. B11-156 and B11-154).
>
> The County Noise Ordinance (B11 154(b) states that, where technically and economically feasible, construction activities shall be conducted in such a manner that the maximum noise levels at affected properties will not exceed those listed in the following schedule:
>
> (i) Mobile equipment. Maximum noise levels for nonscheduled, intermittent, short-term operation (less than 10 days) of mobile equipment:

	Single- and Two-Family Dwelling Residential Area	Residential Area Multifamily Dwelling	Commercial Area
Daily, except Sundays and legal holidays 7:00 a.m.–7:00 p.m.	75 dBA	80 dBA	85 dBA
Daily, 7:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	50 dBA	55 dBA	60 dBA

> (ii) Stationary equipment. Maximum noise levels for repetitively scheduled and relatively long-term operation (periods of 10 days or more) of stationary equipment:

	Single- and Two-Family Dwelling Residential Area	Residential Area Multifamily Dwelling	Commercial Area
Daily, except Sundays and legal holidays 7:00 a.m.–7:00 p.m.	60 dBA	65 dBA	70 dBA
Daily, 7:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	50 dBA	55 dBA	60 dBA

3.12.2 Discussion

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards?

Less-Than-Significant. The project would not result in noticeable increase in noise during operation because only limited, permit-only public access would be allowed, and staff would continue to access the site with approximately the same frequency as under current conditions. The proposed project would result in a temporary increase in construction-generated noise resulting from the creek restoration activities. These activities could require some earth movement and truck hauling. Therefore, noise-generating equipment that would likely be used includes dozers, haul trucks, and loaders. Reference noise levels for these types of equipment are shown below in Table 3.12-1 and noise level estimates are shown in Appendix E.

Table 3.12-1 Equipment Reference Noise Levels

Type of Equipment	Noise Level (L_{max}) at 50 feet
Dozer	85
Dump Truck	84
Front End Loader	80

Source: Data compiled by Ascent Environmental in 2014

Noise generated from these pieces of equipment would be intermittent and short in duration as typical use is characterized by short periods of full-power operation followed by extended periods of operation at lower power, idling, or powered-off conditions. However, as a worst-case scenario, if these pieces of equipment were to operate at full capacity for an entire hour, noise levels could reach up to 46 dBA L_{max} at the nearest offsite sensitive receptors located over 1,000 feet from the construction area.

As identified in Santa Clara County Code of Ordinances, Section B11-156(d), Construction noise is exempt from the County's Exterior Noise Standards. The County Code of Ordinances Section B11-154 sets limits for daytime and nighttime construction noise. As indicated in Section B11-154(b)(i), the daytime limit for construction noise is 75 dBA for single-family residences and the nighttime limit is 50 dBA. The construction noise generated by the proposed project (approximately 54 dBA L_{max}) is modeled to be below the daytime construction noise standards established by the Santa Clara County Code of Ordinances. No nighttime construction would occur for this project, and the project would result in a *less-than-significant* impact.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

No Impact. The proposed project could involve the use of some heavy construction equipment for various creek restoration activities. These activities include, primarily the removal of existing stream crossings and site preparation and digging for new crossings and restoration of associated upland areas. No heavy impact equipment such as drilling or blasting would occur. The types of construction activities that are proposed include minimal site disturbance and are not the types of activities that could result in excessive ground vibrations. Considering the type and number of construction equipment and the distance to the nearest sensitive receptor (over 1,000 feet away from the construction area), the proposed project would not expose people to excessive ground vibration. The project would result in *no impact*.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact. As described above under "a," construction activities associated with the proposed creek restoration activities would be minor and temporary and would not result in noise levels that exceed any applicable Santa Clara County noise standard and therefore would not expose any nearby sensitive receptors to excessive noise levels. No new stationary noise sources or land development would be included in the proposed project. Therefore, the proposed project would not result in any permanent increase in ambient noise levels. There would be *no impact*.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Less-Than-Significant. As discussed under "a" above, the proposed project would involve the use of some noise-generating construction equipment. These types of noise-generating equipment do not operate for extended periods of time and would not exceed any applicable Santa Clara County noise standard, during the daytime or the nighttime due to the distance from sensitive receptors (over 1,000 feet away from the construction area). Therefore, this temporary increase in ambient noise would not result in a significant increase in noise levels at sensitive receptors. This impact would be *less than significant*.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. As mentioned above, the Santa Clara Countywide Airport Land Use Plan (2008) identifies five airports within the county. All five airports are over ten miles from the projects site. The proposed project does not include any occupied structures. Therefore, airport-related noise would not substantially affect the proposed project. *No impact* would occur.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. There are no active private airstrips within two miles of the project site. The proposed project would not expose people within the project area to excessive noise impacts. *No impact* would occur.

3.13 POPULATION AND HOUSING

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. Population and Housing. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing homes, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

3.13.1 Environmental Setting

According to the US Census Bureau, in 2013 Santa Clara County's population totaled 1,862,041 with 642,663 total housing units and an occupation rate of 2.91 persons per household (US Census Bureau 2014). Located in the unincorporated area of Santa Clara County, the project vicinity is sparsely populated, with housing consisting mostly of rural residences, farmhouses, and estates. There is no housing within the project site.

3.13.2 Discussion

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

No Impact. The proposed project does not include construction of new housing or commercial business. Therefore, no direct population growth would result from implementation of the proposed project. Construction would be minimal and short-term, and is not expected to result in employees relocating to the project site. No additional permanent staff would be needed for operation and maintenance of the proposed project. In addition, the long-term use of the project site would be for preservation of open space and would include limited public access controlled by permit. Therefore, the proposed project would have *no impact* on population growth.

b) Displace substantial numbers of existing homes, necessitating the construction of replacement housing elsewhere?

No Impact. The propose project would not include removal of any homes. Numerous unpermitted structures and trailers were located within the project site; however, all of these structures were removed prior to the property being purchased and there are currently no structures on-site. Therefore, the proposed project would have *no impact* on displacement of homes.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No Impact. As described under "b" above, no homes would be displaced as a result of the proposed project. Therefore, no people or existing residences would be displaced, and there would be *no impact*.

3.14 PUBLIC SERVICES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. Public Services. Would the project:				
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☐	☒

3.14.1 Environmental Setting

MROSD participates in fire protection of the Preserve, which will include the project site, in collaboration with other agencies, and primarily relies on CAL FIRE and Santa Clara County Fire Department (SCCFD), with first response and support to the jurisdictional fire agencies by MROSD staff. Fire protection within Santa Clara County is currently provided by 10 municipal fire districts, six county fire districts, two local fire districts, and CAL FIRE. The unincorporated areas of the county, including the project site, are served by the Santa Clara County Central Fire Protection District and CAL FIRE (Santa Clara County 1994). CAL FIRE and SCCFD provide fire suppression, basic and advanced rescue, advanced life support first response medical services, hazardous materials and technical rescue response, fire inspection, fire investigation, disaster preparedness, and public education. There are 259 full time firefighters and 40 volunteer firefighters within the county that are based at 17 fire stations (SCCFD 2010).

MROSD maintains a fire program to assist these agencies with fire response. If a fire occurs on or is threatening MROSD lands, MROSD staff helps establish Incident Command if first on scene, evacuates or closes the Preserves for visitor safety, performs initial attack when safe and effective to do so, provides logistical assistance given staff knowledge of the property, monitors and extinguishes spot fires, and supplies additional water for primary agency engines. MROSD operates a maintenance-style water truck for use in providing water for fire suppression.

Police Protection

MROSD rangers are peace officers authorized to carry out duties in patrolling MROSD preserves to promote visitor safety and provide for the protection of the natural resources of the preserves. MROSD has a total of 27 badged (rangers) (who have attended an MROSD-approved Academy and wear a peace officer badge). In an emergency, any or all of these personnel could be summoned to assist at an incident. In addition, the Santa Clara County Sheriff Office is the primary jurisdictional law enforcement agency that provides law enforcement service to unincorporated areas of Santa Clara County. MROSD staff is responsible for enforcing MROSD regulations most importantly pertaining to vandalism, trespassing, and parking, whereas the Santa Clara County Sheriff Office is primarily responsible for criminal enforcement and all other code sections.

Schools

The project site is located within the Los Gatos Union School District. The nearest school is Lexington Elementary School, located approximately 1.5 miles north of the project site.

Parks

Several large open space preserves are located in the vicinity of the project site including the Sierra Azul Open Space Preserve, which borders the project site to the north, south, and east; Bear Creek Redwoods Open Space Preserve (MROSD Preserve located approximately 2 miles east of the site); and Lexington Reservoir County Park (located approximately 1 mile north of the site).

3.14.2 Discussion

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

Fire protection?

Less than Significant. MROSD assists with fire protection of the existing Preserve in collaboration with other agencies, primarily in reliance on the jurisdictional fire agencies of CAL FIRE and SCCFD, with first response and support to the jurisdictional fire agencies by MROSD staff. The proposed LTMP does not include development of structures in an area where no structures currently exist. In addition, as described in Section 3.8, "Hazards and Hazardous Materials," with the implementation of mitigation measures the proposed project would not result in a substantial increase in risk of wildland fire. Therefore, a substantial increase in demand for fire protection service would not occur, such that new or expanded facilities would be required to maintain appropriate level of service. In addition, Element 6A.3 and corresponding tasks in the LTMP indicate that patrol vehicle access will be maintained within the project site and that wildfire fuel management will be performed. Because the project is not expected to increase the wildfire potential for the site and the site would be managed to minimize fuel load, this impact is considered *less than significant*.

Police protection?

Less than Significant. Law enforcement service in the vicinity of the project site is currently provided by the Santa Clara County Sheriff's Department (criminal) and MROSD rangers (resource protection). Implementation of the proposed project would provide limited, permit-only public access to areas that are not currently accessed by the public. No structures would be developed on the project site. Most emergency responses would be handled internally by MROSD staff and would not tax other law enforcement agencies. Implementation of the proposed project would not result in increased demand for police protection such that new or expanded facilities are necessary to maintain current service levels. This impact is *less than significant*.

Schools?

No Impact. The nearest school is 1.5 miles from the project site and the proposed project would not directly affect any schools. In addition, the proposed project does not include development of new residences and therefore would not result in a substantial effect on the permanent population in the area that would increase the demand for educational services. Implementation of the proposed project would have *no impact* on schools.

Parks?

Less than Significant. The project site would become part of the existing Preserve, and the proposed project would provide additional open space with limited, permit-only public access. Implementation of the proposed project is not expected to increase the demand for other parks and open space facilities, such that new or expanded facilities would be required. This impact is *less than significant*.

Other public facilities?

No Impact. The proposed project does not include development of new residences and therefore would not affect the population in the project area that would increase the demand for other public facilities such as libraries and community centers. Therefore, implementation of the project would have *no impact* on these other services.

3.15 RECREATION

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XV. Recreation. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☒	☐

3.15.1 Environmental Setting

As mentioned in Section 3.14, "Public Services" above, there are several large open space preserves and parks located in the vicinity of the project site including the Sierra Azul Open Space Preserve, which borders the project site to the north, south, and east; Bear Creek Redwoods Open Space Preserve (MROSD Preserve located approximately 2 miles east of the site); and Lexington Reservoir County Park (located approximately 1 mile north of the site). Sierra Azul Open Space Preserve provides for hiking, biking, equestrian use, and Bear Creek Redwoods Open Space Preserve allows hiking and equestrian use. Lexington Reservoir County Park provides hiking, biking, fishing, picnicking, and non-power boating.

3.15.2 Discussion

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Less than Significant. As mentioned above in Section 3.14, "Public Services," the proposed project would provide additional open space that would provide limited, permit-only public access. The proposed project would be connected to the existing Preserve; however, because the project site would only provide limited public access, the proposed project is not expected to increase the demand for other parks and open space facilities, such that new or expanded facilities would be required. This impact is *less than significant*.

b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?

Less than Significant. See the discussion under "a" above. The proposed project would not increase demand for other parks and open space facilities, such that new or expanded facilities would be required and would therefore result in a *less than significant* impact.

3.16 TRANSPORTATION/TRAFFIC

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. Transportation/Traffic. Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

3.16.1 Environmental Setting

The project site is accessible from a deeded access road through private property to Aldercroft Heights Road. Visitors to the project site would either be accompanied by an MROSD docent and access the project site via Aldercroft Heights Road, or would access the property by hiking. There are currently no parking areas within the project site, and because the project site would not be open to the public, designated parking areas would not be provided. The haul route that would be used during construction includes Highway 17 and Aldercroft Heights Road.

3.16.2 Discussion

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Less than Significant. The proposed project does not include public access, except by permit only. No additional MROSD staff are necessary for the proposed project. The proposed creek restoration would generate minimal additional traffic in the long-term (no more than two trips per day), although some trip generation would occur during construction. Construction-related trips would include construction worker trips, as well as haul trips for moving equipment and materials. It is anticipated that project construction would result in no more than 10 worker trips and 2 haul trips per day. Therefore, no substantial short-term or long-term vehicle trip generation would result. The proposed project would not substantially affect the performance of the circulation system and would therefore not conflict with any applicable transportation plans, ordinances, or policies. The project would result in a *less-than-significant* impact.

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

Less than Significant. See discussion under "a" above. The proposed project would generate minimal vehicle trips. Therefore the proposed project would not conflict with a congestion management plan, including level of service standards and other standards for roadway/highway congestion management. The impact is *less than significant*.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

No Impact. Implementation of the proposed project would not involve development of any tall structures and would not alter air traffic patterns. Therefore, the proposed project would result in *no impact*.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact. No vehicle access would be provided to the project site. Therefore, no traffic hazards would result. The proposed project would result in *no impact*.

e) Result in inadequate emergency access?

Less than Significant. The proposed project would maintain access throughout property for routine maintenance and emergency vehicle access. Also see the discussion of emergency access in Section 3.14 "Public Services." Therefore, a less-than-significant impact would result.

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

No Impact. As mentioned above under "a," the proposed project includes limited public access (by permit only) and would not affect the number of visitors that would utilize trails within the existing Preserve. Therefore, demand for bicycle facilities and other alternative modes of transportation would not be affected by the proposed project. There would be *no impact*.

3.17 UTILITIES AND SERVICE SYSTEMS

	ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII.	Utilities and Service Systems. Would the project:				
a)	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b)	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c)	Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
d)	Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e)	Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?	☐	☐	☐	☒
f)	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g)	Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

3.17.1 Environmental Setting

Previously, water for domestic purposes was piped from the seeps and springs within the property. Electricity was provided by generators, solar panels, and batteries, and underground septic systems with leach lines were used for wastewater. However, all structures and septic systems, and the majority of the water piping have been removed from the project site, and the only public utility present on-site is telephone lines.

Stormwater run-off from the site drains naturally. There is no municipal or other formal drainage system; however, culverts and other drainage facilities convey stormwater flow across or through roadways.

The project site is not open to the public, and MROSD does not provide regular trash collection services to the site. MROSD ordinance prohibits public littering or dumping of any material onto Preserves. Illegal trash is removed from the Preserve by MROSD staff and properly disposed of.

Downstream of the project site, Lupin Naturalist Lodge serves approximately 50 residents with their domestic water system. Also downstream, San Jose Water Company draws surface water from an in-stream impoundment in Hendrys Creek. The water is then piped to a pump station where it enters their supply network.

3.17.2 Discussion

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

No Impact. As discussed in the Environmental Setting, all septic systems have been removed from the project site. In addition, no restrooms would be constructed as part of the proposed project, and no wastewater would be generated. The proposed project would result in *no impact* related to wastewater treatment requirements.

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact. See discussion under "a" above. The proposed project would result in *no impact* related to construction of new or expanded wastewater treatment facilities.

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Less than Significant. For the most part, drainage of stormwater runoff occurs naturally on the project site, with the exception of features such as culverts that convey drainage through roadways. The proposed project involves improvements to existing road crossings to prevent erosion and improve water quality, by removing culverts and bridges and installing one new wet ford crossing instead. Environmental impacts associated with these improvements are evaluated in this IS. Impacts associated with installing these drainage facilities are *less than significant*.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

No Impact. As discussed above, the majority of the water piping has been removed from the project site. In addition, the project site would have limited, permit-only public access and no potable water would be provided at the site. No water service is required for implementation of the project. Therefore, the proposed project would result in *no impact* related to water supply capacity.

e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?

No Impact. See discussion under "a" above. The proposed project would result in *no impact* related to wastewater treatment capacity.

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Less than Significant. As discussed above, all structures have been removed from the property; however, implementation of the proposed project would require removal of four bridges and a culvert. Removal of these structures would generate solid waste. Material would be recycled to the greatest extent possible and otherwise hauled to appropriate disposal facilities. Any hazardous material would be abated first per state requirements (see Section 3.9, "Hazards and Hazardous Materials") and would be disposed of at appropriate hazardous waste disposal facilities. The volume of solid waste generated during structure removal would not be substantial.

As mentioned under the Environmental Setting, MROSD does not provide regular trash collection services. Public access to the property would be allowed by permit only, and visitors would be required to dispose of their own trash. MROSD prohibits littering or dumping of any material onto the Preserve. MROSD staff removes any illegal trash, which is typically not substantial in volume, and properly disposes of it. Because implementation of the proposed LTMP involves very limited generation of solid waste, implementation of the proposed project would not conflict with solid waste regulations and impacts to landfills would be *less than significant*.

g) Comply with federal, state, and local statutes and regulations related to solid waste?

Less than Significant. As described under "f" above, the proposed project involves very limited solid waste generation and would not conflict with federal, state, and local statutes or regulations related to solid waste. The impact is *less than significant*.

3.18 MANDATORY FINDINGS OF SIGNIFICANCE

	ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVIII.	Mandatory Findings of Significance.				
a)	Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
b)	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
c)	Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

Authority: Public Resources Code Sections 21083, 21083.5.

Reference: Government Code Sections 65088.4.
Public Resources Code Sections 21080, 21083.5, 21095; Eureka Citizens for Responsible Govt. v. City of Eureka (2007) 147 Cal.App.4th 357; Protect the Historic Amador Waterways v. Amador Water Agency (2004) 116 Cal.App.4th at 1109; San Franciscans Upholding the Downtown Plan v. City and County of San Francisco (2002) 102 Cal.App.4th 656.

3.18.1 Discussion

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?

Less than Significant. As described in the biological resources analysis of this IS (Section 3.4), implementation of the proposed project, including mitigation measures included in this IS/Proposed MND, would result in less-than-significant impacts related to biological resources. Natural Resource Management is one of the overarching goals of the proposed project, including protecting and enhancing habitat and wildlife populations. The proposed project does not have the potential to substantially degrade fish or wildlife habitat, adversely affect wildlife populations, or restrict the range of special-status species. Also, as indicated in the cultural resources analysis of this IS/Proposed MND (Section 3.5), implementation of the proposed project would not adversely affect existing historic structures and mitigation measures would prevent substantial adverse effects to unknown archaeological resources or human remains. These impacts are considered *less than significant*.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

Less than Significant. The proposed project includes very little soil disturbance and does not include construction of new structures or an increase in impervious surfaces. The proposed project is designed to protect and enhance existing natural and cultural resources. As indicated throughout this IS/Proposed MND, implementation of the proposed project would not result in any individually significant impact. In addition, the effects of the proposed project would not combine with the effects of other past, present, or future projects in a cumulatively considerable fashion. The cumulative impacts associated with the proposed project are *less than significant*.

c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?

Less than Significant. The proposed project does not include any new sources of pollution and would not generally involve the use, handling, or transport of hazardous materials. No hazardous materials are identified on the project site that could result in exposure of construction workers or the public to contamination. This impact is *less than significant*.

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Appendix A

SCVWD Stream and Watershed Protection Program Mitigation and Monitoring Plan

ATTACHMENT A

STREAM AND WATERSHED PROTECTION PROGRAM MITIGATION AND MONITORING PLAN

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1.0 INTRODUCTION AND PROGRAM OVERVIEW

The purpose of the Stream and Watershed Protection (S&WP) Program is to provide compensatory mitigation for Stream Maintenance Program (SMP) wetland impacts in the SMP work areas (figure MMRP-1). The S&WP Program supports the overall SMP compensatory mitigation program goal to "balance opportunity, feasibility, and cost to provide the maximum benefit to the natural function of the watersheds and streams of Santa Clara County".

The S&WP Program will provide long-term protection and improvement of unique and valuable local steam resources together with their watersheds, in a largely self-sustaining setting. The primary focus is on streams that are in a fairly undisturbed state and generally good ecological condition. Streams that are currently degraded, but that can be returned to good ecological condition, can also be included in the Program.

The S&WP Program consists primarily of land acquisition, but also provides for some restoration, rehabilitation and/or management projects (restoration projects). Properties containing streams and their immediate watersheds will be acquired. Restoration projects that would benefit stream resources would be conducted on selected acquisition projects or other qualifying lands, as described in this document.

Of the 92 acres of mitigation to be provided by S&WP, acquisition is projected to provide 82 acres of credit, and restoration projects are projected to provide 10 acres of credit. The relative contributions of these sub-components may be adjusted based on opportunity and resource needs identified as the mitigation program progresses.

The term "acquisition" in this document refers to the purchase of fee title or less-than-fee-title (i.e. conservation easement) by the District, or contribution to the acquisition of fee title or easement by another entity. Definitions of "restoration" and "rehabilitation" follow US NRCS 1998.

1.1 Program Area

S&WP Program projects will be located on selected streams within District-related watersheds. Figure MMRP-2 is a schematic depiction of the approximate area of interest for the S&WP Program.

1.2 Dual Mitigation Use

S&WP Program projects that provide mitigation credit for SMP wetland impacts may, in some cases, also provide mitigation for other impacts, including SMP Endangered Species mitigation for red-legged frog and pond turtle. Projects must meet any additional ESA-specific mitigation criteria in order to qualify for ESA mitigation. Only those projects that satisfy the criteria for both the S&WP Program and ESA or other mitigation can be used for dual mitigation credit.

2.0 PROGRAM GOAL AND OBJECTIVES

The goal of the S&WP Program is to preserve, protect and improve the ecological condition of selected local streams and their associated watersheds.

The objectives of the S&WP Program are to:

1) Provide the required mitigation credit for wetland impacts from the SMP
2) Promote self-sustaining, natural process-driven stream and watershed system structure and function (i.e. promote maintenance of dynamic equilibrium with a minimum of human intervention or manipulation).
3) Preserve and protect streams that are currently in good ecological condition
4) Improve stream segments that are disturbed or degraded
5) Provide multiple benefits, whenever possible, by working in a programmatic fashion that takes the regional context and needs into account
6) Identify and select feasible and cost effective projects that, on balance, provide the most environmental benefit to stream resources

3.0 ACQUISITION ELEMENT

3.1 Overview

Lands containing selected streams and their immediate adjacent watershed will be acquired. Examples of suitable land includes ranch land, farm land, and other undeveloped or sparsely developed land. The acquisition element will be mostly accomplished by donating funds to park and open space agencies, land trusts, and other land conservation organizations that will ultimately own title or easement and manage the property. The District's contribution will typically provide partial funding of a larger acquisition, however, in some cases the District may choose to purchase and retain sole ownership or easement.

The District will evaluate each potential acquisition project using a hierarchical decision process. At the first tier, each potential acquisition project must meet a standard set of mandatory criteria, termed "Requisite Criteria", to qualify under the Program (Appendix A). These criteria ensure that the mitigation goal is met and mitigation credit is obtained (e.g., land must include a stream of a minimum size and condition, must be located in a watershed associated with a stream in District jurisdiction, must be located in the basin in which impacts occur). Any project that satisfies the Requisite Criteria would meet the program goal and objectives 1- 3 (Section 2.0), and could provide mitigation credit.

Those parcels that meet the Requisite Criteria will be further evaluated using Priority Evaluation Considerations (Appendix B) to determine their relative priority for acquisition. Priority Evaluation Considerations include site-specific habitat features (e.g., type and condition of stream resources, presence of endangered species or habitat), acquisition transaction-related features (e.g., level of protection gained, time frame for purchase), and regional considerations (e.g., links with adjacent protected lands, provision of multiple agency and community benefits). Relative priority for acquisition will be determined based on a collective qualitative assessment of these considerations. Higher ranked parcels will be recommended for purchase. Review and ranking under the Priority Evaluation Considerations ensures that S&WP Program objectives 5 and 6 are met (Section 2.0).

Characterization of site and project features will be based on existing, available data (e.g., USGS and other maps, aerial photographs, reports, etc.), and on reconnaissance-level field surveys. See Appendix C for an example of report graphics for acquisition projects.

Acceptable long-term land use and land management parameters, particularly for the mitigation credit area of a parcel, will be specified as part any partnership purchase agreement. Land will be monitored periodically to ensure that the terms of acquisition continue to be met. The tentative schedule for site inspections is every 2 years for the first 10 years after acquisition, and every 5 years thereafter. Any District-owned or managed lands will also be inspected on the same schedule.

3.2 Implementation Plan

The general approach for acquisition implementation is outlined below.

- Identify available land (project)
- Determine if project qualifies for Program (i.e. meets Requisite Criteria)
- Review Priority Evaluation Considerations for qualified projects
- Recommend and obtain approval for acquisition of higher priority projects from permitting agencies (if necessary, see section 5.0) and District Board of Directors (required for all District land purchases)
- Purchase or contribute to purchase of fee title or easement on preferred parcels
- Conduct long-term periodic monitoring to confirm intended land use and management

3.3 Mitigation Credit

Mitigation credit is directly linked with the presence of streams on-site, and the proximity of the watershed land to the stream(s). Maximum credit is obtained for land that includes the stream and its most immediate adjacent watershed. Less credit is obtained for watershed land somewhat further from the stream.

The crediting ratio and approach is designed to guarantee that substantial benefit is generated to streams when applied on a programmatic basis to a variety of sites with variable characteristics. The relatively high mitigation-to-impact acre ratio ensures protection of large amounts of stream and watershed area compared to impacts. Inclusion of immediately adjacent watershed land recognizes and values the integral function of streams and watersheds. Although the entire watershed influences stream condition, those areas closest to the stream may exert the strongest influence. The mitigation zones create practical stream management areas, and incorporate adequate area to provide for a variety of stream functions, including support of stream-dependent species that also use watershed areas, such as red-legged frog.

The crediting formula is:

- Maximum credit: 10:1 - including and nearest to the stream. This comprises the area within 50 feet of the centerline on 1st order streams, and within 150 feet of centerline on 2nd order and larger streams.

- Minimum credit: 15:1 - including watershed land further from the stream. This comprises the area within 150 to 500 feet of the centerline of 2nd order and larger streams

The minimum amounts of stream and immediate watershed acreage and stream length obtained by application of this crediting formula are:

- A minimum of 10 acres of stream and immediate watershed land acquired per acre of wetland impacted
- A minimum of 1 mile of stream acquired per 10 acres of wetland impacted

Under this formula, more than the minimum acreage or stream miles may be obtained per acre of impact, depending on acquisition site features (e.g., relative amounts of 1st and 2nd order streams, available adjacent watershed widths).

See Appendix C for an example of acquisition project credit area determination.

3.4 Final Success Criteria

The final measure of success will be the completed acquisition of fee title or easements on land selected in accordance with the Requisite Criteria and the Priority Evaluation Considerations in the amount required to fulfill total mitigation obligations.

4.0 RESTORATION, REHABILITATION AND/OR MANAGEMENT ELEMENT

4.1 Restoration, Rehabilitation and/or Management Overview

Properties under consideration for acquisition will be evaluated to determine whether the steam resources would benefit from restoration, rehabilitation and/or management projects (restoration projects). Restoration projects may also be conducted on other lands not acquired under this program. These lands must have the qualifying physical and management characteristics listed under Requisite Criteria (i.e., stream size, stream condition, habitat contiguity, basin locations, and land management). The feasible restoration projects deemed to produce good benefit at a reasonable cost will be recommended for implementation. Implementation of restoration projects meets S&WP Objective No. 4 (Section 2.0)

Examples of actions that could be done to improve stream condition include: 1) removal of nonnative riparian plant species and revegetation with native species; 2) sedimentation reduction measures such as stream-side and watershed road modifications and culvert re-design; 3) and reduction of trampling by installation of fencing and alternative water sources to limit cattle and feral pig access to sensitive riparian areas.

Restoration projects for streams that meet the S&WP Program standard for good ecological condition (as defined under Requisite Criteria, Appendix A) would be optional. Restoration projects would be mandatory for acquisitions that do not meet the S&WP Program standard for good ecological condition, in order to bring them up to the defined standard.

Project implementation includes individual project planning, permitting, environmental review, design, installation, monitoring, and maintenance, as appropriate for the specific project. An individual project-specific MMP will be formulated for each project. The MMP will include the project description, goal, implementation plan and schedule, success criteria, monitoring types and methods, maintenance plan and monitoring report schedule.

4.2 Implementation Plan

The general approach for implementation of restoration projects is outlined below.

For Lands Acquired by the S&WP Program:

- Preliminary identification of potential restoration, rehabilitation and/or management needs (pre-acquisition)
- Priority evaluation, feasibility analysis and final identification of restoration projects (post-acquisition for optional restoration projects, pre-acquisition for mandatory projects)
- Submit proposed higher priority projects to S&WP Review Panel, if necessary (see section 5.0) and District Board for approval (Board approval is required for all District land purchases)
- Draft a project-specific MMP
- Implement and monitor project in accordance with the project-specific MMP

For Other Lands:

- Determine that the proposed project qualifies for initial consideration. The project must be located on land that satisfies the physical feature and management elements of the Requisite Criteria (Criteria 1-6, Appendix A)
- Review and rank the priority of qualified parcels based on the site-specific habitat and regional aspects of the Priority Evaluation Considerations (Appendix B)
- For higher-ranked lands, follow steps under "For Acquisition Lands" above

4.3 Mitigation Credit

Credit for restoration projects will be generated on a dollar value basis as follows: 1 acre of mitigation credit is obtained for each $150,000 of projects funded. The $150,000 figure is based on the approximate per acre cost of District riparian mitigation projects recently implemented in the lower watershed. The cost per acre includes, as applicable, project design (including conceptual design, detailed design, MMP, Engineer's Report), installation or other actions, monitoring, reporting, and maintenance.

Initial identification of potentially suitable restoration or management projects, project-specific CEQA evaluation, permit acquisition, S&WP Review Panel process (if required, see Section 5.0), land use agreement negotiation, and consultant and construction contract management are not included in the cost per acre figure. Therefore, the per-acre cost to the District is greater than $150,000, and will vary based on project needs. The $150,000 per acre cost will be adjusted to reflect inflation as the program progresses.

4.4 Final Success Criteria:

Final success criteria will be formulated on a project specific basis to determine if a project is trending towards, or has achieved the individual defined project goal. The criteria will be specified in the MMP. Success criteria will consist of qualitative or quantitative evaluation of physical features such as vegetation, soil condition, sedimentation, erosion, and condition of installed features (e.g., culverts, fences). For example, a revegetation project may have quantitative plant survival, vegetative cover, and vegetation type performance and success criteria like those of a standard revegetation project. A culvert retrofitting project might require periodic inspection to confirm proper operation and visual evidence of reduced soil erosion.

The S&WP Program restoration element will be completed when all projects required to meet the SMP mitigation obligation have met their individual success criteria.

5.0 PROJECT REVIEW AND APPROVAL

This document provides an initial program description and approach. As the Program progresses, implementation details may be modified to make improvements, as long as these are consistent with the program goal and objectives. Initially, acquisition and restoration projects will be reviewed and approved by permitting agencies on a case-by-case basis prior to implementation. Less oversight is expected over time, however, as implementation experience is used to “fine tune” the implementation process. The ultimate goal is to formulate reliable criteria and procedures that eliminate the need for prior project review and approval by permitting agencies. Once this is accomplished, proposed and completed projects will continue to be fully documented in the District’s annual S&WP Program monitoring report to the agencies.

A review panel comprising permitting agency and District staff will be set up to expedite the project review process. This is a necessary function of a programmatic land acquisition program, which relies upon the ability to act quickly and efficiently to capitalize on opportunities. The members of the S&WP Review Panel will convene, review and decide on approval of proposed acquisition projects (and any linked mandatory restoration projects required to restore minimum ecological condition as set for in Requisite Criteria, see Section 4.1) within 4 weeks of notification by the District. Otherwise, after the 4 week notification period, the project will automatically be approved. Optional restoration projects will be reviewed and approved within 12 weeks of notification by the District, or automatically approved.

6.0 RESPONSIBLE PARTIES

The District will be responsible for the implementation and success of the mitigation program. The Program contact is Ms. Gale Rankin, Biologist III, Ecological Services Unit.

7.0 SCHEDULE

The Program will be implemented over 10 years. Acquisition will be completed, and restoration projects will be identified in order to meet the interim milestones. The milestones are:

- 1/4 of the mitigation credit obtained by completed acquisition of property and/or identification of approved restoration projects by year 3
- ½ of credit obtained by year 6
- all of credit obtained by year 10

The target for restoration project implementation is within 3 years after project approval.

8.0 PROGRAM MONITORING AND REPORTING

An annual S&WP Program report will be prepared and submitted to the relevant agencies for 10 years or until all required mitigation credit is obtained under the S&WP Program. The report will summarize all S&WP Program actions, their status, mitigation credits obtained to date, and will compare progress to the program schedule and interim milestones.

The annual Program report will document progress towards attainment of the Program acquisition and restoration project success criteria. Each annual report will include a description of all parcels considered and acquired in the past year, detailing the location, size, and stream and watershed amount present. The report will summarize the Requisite Criteria and Priority Evaluation Criteria analyses. The mitigation credit earned, the entity that will own the fee title or conservation easement, planned land use (e.g., public park or open space, private ranch land, farm land), and planned restoration projects will be described for all acquired parcels. Maps showing acquired parcel locations, boundaries, streams, and mitigation credit areas will be included (see Appendix C). Summary descriptions of all proposed, approved and implemented acquisition and restoration projects for all years will also be provided.

In addition, individual monitoring reports based on the project-specific MMPs will be prepared for each restoration project (Section 4.1). Monitoring programs and report contents will be appropriate for the particular action taken. Individual monitoring reports will be submitted with the Program report.

Both the Program and individual site-specific monitoring reports will identify potential problems that may prevent attainment of project success, and recommend and document any remedial actions. The annual Program report will describe any changes to in program methods or procedures, including those that result from S&WP Review Panel recommendations.

The S&WP Program is a biological mitigation program, and Program monitoring and reporting will be prepared under the supervision of a qualified biologist or other qualified environmental specialist. Restoration project monitoring and reporting will be done by qualified professionals with expertise in the major field of endeavor (e.g., civil engineer for erosion control measures on culverts and roads, biologist for fish passage or revegetation).

Periodic long term monitoring of acquisition projects will be conducted to ensure that land use and management is consistent with the terms and agreements of the District's financial contribution (Section 3.1). Long-term monitoring of restoration projects will be conducted as specified in the project-specific MMPs, as needed to ensure long-term functional success of projects.

Long-term monitoring reports will be submitted in post-completion years 5 and 10 (after full mitigation credit has been obtained by the Program). In post-completion year 10, the need for further monitoring and reports to document acquisition and restoration project status will be evaluated. Further monitoring and reporting will be continued or discontinued as determined at that time. Reporting shall continue no longer than the life of the SMP for which mitigation is provided.

9.0 CONTINGENCY MEASURES

If success standards for individual projects or the program as a whole are not met and there is reason to believe that they will not be met , and analysis of the causes will be conducted and, if deemed necessary, corrective actions will be taken.

10.0 REFERENCES

United States Natural Resources Conservation Service (US NRCS); United States. Federal Interagency Stream Restoration Working Group. 1998. Stream Corridor Restoration: Principle, Purposes, Practices. Washington, D.C. : Natural Resources Conservation Service ; Springfield, Va.. Distributed by National Technical Information Service.

APPENDIX A

SCVWD STREAM AND WATERSHED PROTECTION PROGRAM REQUISITE CRITERIA FOR LAND ACQUISITION

All of the Requisite Criteria must be satisfied for a parcel to qualify for acquisition and mitigation credit.

1) The land includes a second order or greater stream reach (stream order determined from USGS 7.5' quadrangle map), as determined from the upstream end (per Strahler 1957 in US NRCS 1998).

2) The streams on-site are or can be improved to be in good ecological condition by this program (see stream condition determination below)

   A stream on the acquisition parcel will be considered to be in good condition if the following criteria are met:

   a) The stream reach on the acquisition parcel is largely unaltered by direct modification

   - On at least 80% of the stream length occurring on the parcel, the stream bed and bank is natural, with bottom and side slopes of native material, and with little or no evidence of direct physical modification (i.e. channel not mechanically straightened, widened, covered with hardscape or crossed by bridges for more than 20% of channel length).

   - If less than 80% of the stream length is in the condition described above, the stream bed or banks can and will be rehabilitated or restored for at least 80% of stream length.

   b) The stream reach on the acquisition parcel supports predominantly native riparian or other native woody vegetation consistent with site potential.

   - For at least 80% of the stream length (on the parcel): woody stream-side vegetation canopy occupies at least 75% of the stream corridor and canopy cover within woody vegetation patches is least 75%.

     Lower extent or percent cover is acceptable if explained by natural site features that control the site's capability to support vegetation, such as substrate, slope, and aspect. For example vegetation may be sparser on a very steep gradient or on well-drained course alluvium.

   - < or = to 40% of relative linear extent of stream-side vegetation comprises cover of non-native woody canopy.

- < or = to 10% of the total relative linear extent of stream-side vegetation comprises cover of invasive woody or herbaceous species.

3) The parcel's stream(s) is contiguous with transitional upland and stream habitats.

    a) The immediately adjacent watershed land (within 500 feet of the stream centerline) is, and will remain, undeveloped or lightly developed on at least one side (immediately adjacent watershed may be farm or ranch land; a stream-side road may be present).

    b) Similar stream habitat occurs either upstream or downstream of the site's largest stream (i.e. the stream is not an isolated fragment).

4) The land is located in a watershed that is associated with streams within the District's jurisdiction.

5) The land is located within the same basin as the impacts to be credited (San Francisco Bay or Monterey Bay basins).

6) The planned long term on-site land use and/or management is consistent with maintenance of good stream condition. Minimum standards or criteria for grazing management and trail routing, particularly within the mitigation credit area, may be formulated as the Program progresses.

7) The land was not already protected under public ownership, under ownership by a private land conservation organization, or under conservation easement prior to the acquisition action to which the District is contributing. (The District may make it's financial contribution within 18 months of the purchase).

8) The land is potentially subject to current or future development or degradation or presents a unique conservation opportunity.

9) The land is not under consideration for purchase for other non-mitigation or enhancement purposes by the District (such as to provide for flood protection). The land may be used for other mitigation or enhancement projects.

10) The land is available from a willing seller.

APPENDIX B

SCVWD STREAM AND WATERSHED PROTECTION PROGRAM PRIORITY EVALUATION CONSIDERATIONS FOR ACQUISITION

SITE-SPECIFIC HABITAT FEATURES

Size and General Descriptive Setting

1) Site size (total)
2) Total mitigation acreage
3) Site location, land use, general topography and relationship to streams, general vegetation description
4) Length, order and perennial or ephemeral status of each stream on entire sites and within mitigation credit area (larger streams and/or perennial streams have higher priority)
5) General stream-related vegetation types
6) General physical features of streams(s)
7) Potential Constraints
8) Other

Features of the Mitigation Credit Area

1) Areas known to be occupied by California red-legged frogs or western pond turtles
2) Biological or natural features consistent with the habitat requirements of the California red-legged frog or western pond turtle present
3) Other special-status species or their potential habitat present
4) Other noteworthy biological or natural features present (e.g., native fisheries, locally rare species or habitats, contribution to maintenance of cool summer water temperatures on site and downstream)
5) Includes erosion/sedimentation problems that will be addressed by an S&WP restoration project

Features of the Remainder of the Parcel (outside the mitigation credit area)

1) Areas known to be occupied by California red-legged frogs or western pond turtles
2) Biological or natural features consistent with the habitat requirements of the California red-legged frog or western pond turtle present
3) Other special-status species or their potential habitat present
4) Other noteworthy biological or natural features present
5) Includes erosion/sedimentation problems that will be addressed by a S&WP restoration project

ACQUISITION TRANSACTION FEATURES

1) Potential threats to property if not acquired
2) Protection attained
3) Unique opportunity presented (e.g., multiple contiguous parcels available together, key location to link public lands)
4) Time frame for completion of acquisition
5) Transaction manageability (e.g., contract complexity/agreement monitoring)
6) Amount of mitigation credit generated
7) Other

REGIONAL FEATURES

1) Supports a watershed-wide programmatic approach to maintenance mitigation by maximizing regional, long-term, ecological benefits.
   - Identify whether a target stream is involved
   - Identify links with other land planning, preservation or management efforts (e.g. WMI, FAHCE)
   - Identify other regional, long-term ecological benefits
2) Considers adjacent land uses, ownership, and linkages with other protected lands (current or planned) including mitigation sites and parks in determining site value and function
3) Acquisition program considers watershed position in overall evaluation, and considers potential increased values of lower watershed locations
4) Provides multiple benefits to the public good by supporting other interests of the District or the interests of other agencies, community groups or organizations
5) Other

APPENDIX C

Mock Acquisition Example
Supporting Graphics and Mitigation Credit Area Determination

A "mock parcel" acquisition is presented to illustrate GIS maps and graphics produced during candidate project review and to illustrate the mitigation credit calculation method. The mock parcel is an imaginary, approximately 500 acre partnership acquisition parcel based on a real world location Parcel boundaries; stream locations, orders, and lengths; and the location and sizes of mitigation credit areas will be determined using existing information and maps. Data sources include assessors parcel maps and USGS topographic maps. Most information will be overlain and evaluated with the ArcView GIS program.

Regional Context:

1) **Regional Map** (not shown). The parcel will be shown in it's regional context, showing other streams, parks and open space, nearby cities and other regional features. This map will be similar to an enlarged quadrant of Figure MMRP-2. Unlike a real candidate parcel, the mock parcel location cannot be specified, and no example graphic is provided.

2) **Figure MMRP-3: Vicinity Map**. The parcel is shown in relationship to features in the immediate vicinity on a USGS topographic map or other existing map or aerial photograph. Relevant features such as other public lands, mitigation sites, or developments are shown. In this example, the mock parcel is located directly north of other existing public land and just upstream of a small development.

Site features:

3) **Figure MMRP-4: Site Map.** General site features, such as topography, streams, dirt and paved roads and buildings are shown in more detail on existing available topographic maps or aerial photographs.

Stream identification:

4) **Figure MMRP-5.** The SCVWD 500 scale creeks map and the USGS 2000 scale creeks map show two versions (one more detailed, one less detailed) of stream mapping of the site.

> **5a) SCVWD 500 Scale Creeks.** The SCVWD 500 Scale Creeks map shows all streams on the District GIS layer of the same name. Most of this data was obtained from Barclay Mapworks, Inc., Mountain View, CA, based on hand digitized information from 1" = 500' scale maps. Streams within District jurisdiction (i.e. with watersheds of 320 acres or more) are indicated by bold lines. In this example, the largest stream on the mock parcel is within the District's jurisdiction (indicated by a heavier blue line). Five other streams are tributaries to the larger stream, and several of these have their own tributaries. This data layer provides more detailed background information on streams than USGS maps, but is not used to determine which streams qualify for mitigation credit.

5b) USGS 2000 Scale Map. The USGS 2000 Scale Creeks map shows, in isolation, all streams mapped on a standard USGS 7.5 minute topographic quadrangle map (quad). The stream order of all creeks within the parcel is also shown.

USGS 7.5' quads will be the standard used to identify streams that qualify for mitigation credit under the S&WP Program, and to determine stream order and length. This insures standard mapping regardless of parcel location. The program gains credit from acquisition of 1st order or greater USGS 1:24,000 (2000 scale) creeks. Note that only the largest stream and two of the five tributary streams on the SCVWD 500 scale creeks layer appear on the USGS map. USGS mapping was done at a less detailed scale, and therefore does not include many of the smaller tributaries mapped by the SCVWD layer.

Stream order is determined from the top of the watershed down, using the method of Straher (US NRCS 1998), so that smaller streams with no upstream tributaries are 1st order streams. The mock parcel contains a segment of one 2nd order stream and complete reaches of two 1st order streams.

The full detail USGS quad map (Figure MMRP-4) classifies the largest stream as perennial (solid blue line), and the 2 smaller streams as intermittent (dashed blue line).

Credit Area Determination

5) Figure MMRP-6: Mitigation Credit Area. The mitigation credit zone boundaries around the qualifying USGS mapped streams are determined using GIS (ArcView). Figure MMRP-6 shows the 50 foot zones around two 1st order streams, and the extent of 150 and 500 foot zones around the 2nd order stream (Section 3.2). The amount of acreage within each zone is calculated by the GIS. The corresponding mitigation ratio (10:1 or 15:1) is applied to each area, and the mitigation credit amount is determined (Table 1).

In this example, the mitigation area would comprise 152 acres of the approximately 500 acre parcel (Table 1). The District would contribute funding for 152 acres to the partnership acquisition of the entire parcel. Other partners would contribute the remaining funds. The fee title or easement for the entire parcel would then be held by a park, open space or conservation organization.

The District's contribution to the mock parcel acquisition results in:

1) 12.1 acres of mitigation credit obtained
2) 2.5 miles of stream acquired (equivalent to 2.1 miles of stream per 10 acres of impact)
3) 152.5 acres of stream and immediate watershed land acquired (equivalent to 12.6:1 acquisition to impact ratio)

The actual amount of stream miles and acres acquired per acre impacted will vary based on site features, but would be no less than 10 ac acquired per acre impacted, and 1 mile of stream per 10 acres impacted (Section 3.3).

TABLE 1. Mock Parcel Mitigation Credit

Mitigation Area Feature	Stream Miles Present	Stream and Watershed Land (ac)	Mitigation Ratio	Mitigation Credit (ac)
First Order Streams	1.21			
Second Order Streams	1.32			
1st Order Stream 50' buffer Area		11.51	10:1	1.15
2nd Order Stream 150' Buffer Area		45.61	10:1	4.56
2nd Order Stream 150-500' Buffer Area		95.35	15:1	6.36
Total	**2.5 miles**	**152.5 acres**		**12.1 acres**

Appendix B

Air Quality Modeling

Hendrys Creek

Santa Clara County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	10.70	Acre	10.70	466,092.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	5			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - City park is used to represent the improvements at Hendrys Creek but only construction emissions are being used for this analysis. 10.7 acres of disturbance estiamte from project description

Construction Phase - 3 month construction but only minor earth work for improvements

Off-road Equipment - assumed based on proposed construction activities

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	120.00	88.00
tblConstructionPhase	PhaseEndDate	7/31/2015	8/1/2015
tblOffRoadEquipment	HorsePower	97.00	140.00
tblOffRoadEquipment	HorsePower	162.00	97.00
tblOffRoadEquipment	LoadFactor	0.37	0.40
tblOffRoadEquipment	LoadFactor	0.38	0.37
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Site Preparation
tblProjectCharacteristics	OperationalYear	2014	2015
tblTripsAndVMT	WorkerTripNumber	15.00	8.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0395	0.3520	0.2640	3.8000e-004	0.5994	0.0211	0.6204	0.3286	0.0194	0.3479	0.0000	35.7685	35.7685	9.9700e-003	0.0000	35.9779
Total	**0.0395**	**0.3520**	**0.2640**	**3.8000e-004**	**0.5994**	**0.0211**	**0.6204**	**0.3286**	**0.0194**	**0.3479**	**0.0000**	**35.7685**	**35.7685**	**9.9700e-003**	**0.0000**	**35.9779**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0395	0.3516	0.2637	3.8000e-004	0.5994	0.0210	0.6204	0.3286	0.0193	0.3479	0.0000	35.7295	35.7295	9.9600e-003	0.0000	35.9386
Total	**0.0395**	**0.3516**	**0.2637**	**3.8000e-004**	**0.5994**	**0.0210**	**0.6204**	**0.3286**	**0.0193**	**0.3479**	**0.0000**	**35.7295**	**35.7295**	**9.9600e-003**	**0.0000**	**35.9386**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.1012**	**0.1193**	**0.1099**	**0.0000**	**0.0000**	**0.1425**	**4.8353e-003**	**0.0000**	**0.1033**	**8.6224e-003**	**0.0000**	**0.1092**	**0.1092**	**0.1003**	**0.0000**	**0.1093**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.4779	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9000e-004	1.9000e-004	0.0000	0.0000	2.0000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0285	0.0236	0.1088	1.9000e-004	0.0135	3.1000e-004	0.0138	3.6000e-003	2.8000e-004	3.8900e-003	0.0000	15.1829	15.1829	7.1000e-004	0.0000	15.1978
Waste						0.0000	0.0000		0.0000	0.0000	2.0421	0.0000	2.0421	0.1207	0.0000	4.5765
Water						0.0000	0.0000		0.0000	0.0000	0.0000	141.9391	141.9391	6.4200e-003	1.3300e-003	142.4855
Total	**4.5064**	**0.0236**	**0.1089**	**1.9000e-004**	**0.0135**	**3.1000e-004**	**0.0138**	**3.6000e-003**	**2.8000e-004**	**3.8900e-003**	**2.0421**	**157.1221**	**159.1642**	**0.1278**	**1.3300e-003**	**162.2599**

2.2 Overall Operational

Mitigated Operational

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Area	4.4779	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9000e-004	1.9000e-004	0.0000	0.0000	2.0000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0285	0.0236	0.1088	1.9000e-004	0.0135	3.1000e-004	0.0138	3.6000e-003	2.8000e-004	3.8900e-003	0.0000	15.1829	15.1829	7.1000e-004	0.0000	15.1978
Waste						0.0000	0.0000		0.0000	0.0000	2.0421	0.0000	2.0421	0.1207	0.0000	4.5765
Water						0.0000	0.0000		0.0000	0.0000	0.0000	141.9391	141.9391	6.4200e-003	1.3300e-003	142.4855
Total	**4.5064**	**0.0236**	**0.1089**	**1.9000e-004**	**0.0135**	**3.1000e-004**	**0.0138**	**3.6000e-003**	**2.8000e-004**	**3.8900e-003**	**2.0421**	**157.1221**	**159.1642**	**0.1278**	**1.3300e-003**	**162.2599**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	4/1/2015	8/1/2015	5	88	

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Excavators	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	140	0.40

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	6	8.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2015

Unmitigated Construction On-Site

Acres of Grading: 0

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5962	0.0000	0.5962	0.3277	0.0000	0.3277	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0324	0.3500	0.2440	3.4000e-004		0.0210	0.0210		0.0193	0.0193	0.0000	32.8435	32.8435	9.8100e-003	0.0000	33.0494
Total	**0.0324**	**0.3500**	**0.2440**	**3.4000e-004**	**0.5962**	**0.0210**	**0.6172**	**0.3277**	**0.0193**	**0.3471**	**0.0000**	**32.8435**	**32.8435**	**9.8100e-003**	**0.0000**	**33.0494**

3.2 Site Preparation - 2015

Unmitigated Construction Off-Site

Acres of Grading: 0

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0900e-003	2.0600e-003	0.0200	4.0000e-005	3.2000e-003	3.0000e-005	3.2300e-003	8.5000e-004	2.0000e-005	8.8000e-004	0.0000	2.9250	2.9250	1.7000e-004	0.0000	2.9285
Total	**7.0900e-003**	**2.0600e-003**	**0.0200**	**4.0000e-005**	**3.2000e-003**	**3.0000e-005**	**3.2300e-003**	**8.5000e-004**	**2.0000e-005**	**8.8000e-004**	**0.0000**	**2.9250**	**2.9250**	**1.7000e-004**	**0.0000**	**2.9285**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5962	0.0000	0.5962	0.3277	0.0000	0.3277	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0324	0.3495	0.2437	3.4000e-004		0.0210	0.0210		0.0193	0.0193	0.0000	32.8045	32.8045	9.7900e-003	0.0000	33.0101
Total	**0.0324**	**0.3495**	**0.2437**	**3.4000e-004**	**0.5962**	**0.0210**	**0.6172**	**0.3277**	**0.0193**	**0.3470**	**0.0000**	**32.8045**	**32.8045**	**9.7900e-003**	**0.0000**	**33.0101**

3.2 Site Preparation - 2015

Mitigated Construction Off-Site

Acres of Grading: 0

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0900e-003	2.0600e-003	0.0200	4.0000e-005	3.2000e-003	3.0000e-005	3.2300e-003	8.5000e-004	2.0000e-005	8.8000e-004	0.0000	2.9250	2.9250	1.7000e-004	0.0000	2.9285
Total	**7.0900e-003**	**2.0600e-003**	**0.0200**	**4.0000e-005**	**3.2000e-003**	**3.0000e-005**	**3.2300e-003**	**8.5000e-004**	**2.0000e-005**	**8.8000e-004**	**0.0000**	**2.9250**	**2.9250**	**1.7000e-004**	**0.0000**	**2.9285**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0285	0.0236	0.1088	1.9000e-004	0.0135	3.1000e-004	0.0138	3.6000e-003	2.8000e-004	3.8900e-003	0.0000	15.1829	15.1829	7.1000e-004	0.0000	15.1978
Unmitigated	0.0285	0.0236	0.1088	1.9000e-004	0.0135	3.1000e-004	0.0138	3.6000e-003	2.8000e-004	3.8900e-003	0.0000	15.1829	15.1829	7.1000e-004	0.0000	15.1978

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	17.01	17.01	17.01	36,320	36,320
Total	17.01	17.01	17.01	36,320	36,320

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.552608	0.057937	0.185322	0.124470	0.029726	0.004465	0.012479	0.021685	0.001768	0.001276	0.005971	0.000530	0.001762

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.4779	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9000e-004	1.9000e-004	0.0000	0.0000	2.0000e-004
Unmitigated	4.4779	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9000e-004	1.9000e-004	0.0000	0.0000	2.0000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.6575					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.8203					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9000e-004	1.9000e-004	0.0000	0.0000	2.0000e-004
Total	**4.4779**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.9000e-004**	**1.9000e-004**	**0.0000**	**0.0000**	**2.0000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.6575					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.8203					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.9000e-004	1.9000e-004	0.0000	0.0000	2.0000e-004
Total	**4.4779**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.9000e-004**	**1.9000e-004**	**0.0000**	**0.0000**	**2.0000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	141.9391	6.4200e-003	1.3300e-003	142.4855
Unmitigated	141.9391	6.4200e-003	1.3300e-003	142.4855

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 139.403	141.9391	6.4200e-003	1.3300e-003	142.4855
Total		**141.9391**	**6.4200e-003**	**1.3300e-003**	**142.4855**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 139.403	141.9391	6.4200e-003	1.3300e-003	142.4855
Total		**141.9391**	**6.4200e-003**	**1.3300e-003**	**142.4855**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.0421	0.1207	0.0000	4.5765
Unmitigated	2.0421	0.1207	0.0000	4.5765

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	10.06	2.0421	0.1207	0.0000	4.5765
Total		**2.0421**	**0.1207**	**0.0000**	**4.5765**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	10.06	2.0421	0.1207	0.0000	4.5765
Total		**2.0421**	**0.1207**	**0.0000**	**4.5765**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Hendrys Creek

Santa Clara County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	10.70	Acre	10.70	466,092.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	5			**Operational Year**	2015
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - City park is used to represent the improvements at Hendrys Creek but only construction emissions are being used for this analysis. 10.7 acres of disturbance estiamte from project description

Construction Phase - 3 month construction but only minor earth work for improvements

Off-road Equipment - assumed based on proposed construction activities

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	120.00	88.00
tblConstructionPhase	PhaseEndDate	7/31/2015	8/1/2015
tblOffRoadEquipment	HorsePower	97.00	140.00
tblOffRoadEquipment	HorsePower	162.00	97.00
tblOffRoadEquipment	LoadFactor	0.37	0.40
tblOffRoadEquipment	LoadFactor	0.38	0.37
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	PhaseName		Site Preparation
tblProjectCharacteristics	OperationalYear	2014	2015
tblTripsAndVMT	WorkerTripNumber	15.00	8.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	0.8918	7.9951	6.0322	8.7400e-003	13.6251	0.4783	14.1034	7.4680	0.4400	7.9081	0.0000	901.5314	901.5314	0.2498	0.0000	906.7771
Total	**0.8918**	**7.9951**	**6.0322**	**8.7400e-003**	**13.6251**	**0.4783**	**14.1034**	**7.4680**	**0.4400**	**7.9081**	**0.0000**	**901.5314**	**901.5314**	**0.2498**	**0.0000**	**906.7771**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2015	0.8911	7.9878	6.0271	8.7400e-003	13.6251	0.4779	14.1030	7.4680	0.4396	7.9077	0.0000	900.7765	900.7765	0.2496	0.0000	906.0175
Total	**0.8911**	**7.9878**	**6.0271**	**8.7400e-003**	**13.6251**	**0.4779**	**14.1030**	**7.4680**	**0.4396**	**7.9077**	**0.0000**	**900.7765**	**900.7765**	**0.2496**	**0.0000**	**906.0175**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.0763**	**0.0913**	**0.0844**	**0.0000**	**0.0000**	**0.0920**	**3.1198e-003**	**0.0000**	**0.0909**	**5.0581e-003**	**0.0000**	**0.0837**	**0.0837**	**0.0921**	**0.0000**	**0.0838**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	24.5362	1.0000e-005	1.1300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.3400e-003	2.3400e-003	1.0000e-005		2.4800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1528	0.1219	0.5860	1.0900e-003	0.0767	1.7000e-003	0.0784	0.0204	1.5600e-003	0.0220		97.4160	97.4160	4.2900e-003		97.5062
Total	**24.6891**	**0.1219**	**0.5871**	**1.0900e-003**	**0.0767**	**1.7000e-003**	**0.0784**	**0.0204**	**1.5600e-003**	**0.0220**		**97.4183**	**97.4183**	**4.3000e-003**	**0.0000**	**97.5087**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	24.5362	1.0000e-005	1.1300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.3400e-003	2.3400e-003	1.0000e-005		2.4800e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1528	0.1219	0.5860	1.0900e-003	0.0767	1.7000e-003	0.0784	0.0204	1.5600e-003	0.0220		97.4160	97.4160	4.2900e-003		97.5062
Total	**24.6891**	**0.1219**	**0.5871**	**1.0900e-003**	**0.0767**	**1.7000e-003**	**0.0784**	**0.0204**	**1.5600e-003**	**0.0220**		**97.4183**	**97.4183**	**4.3000e-003**	**0.0000**	**97.5087**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	4/1/2015	8/1/2015	5	88	

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Excavators	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	140	0.40

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	6	8.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Site Preparation - 2015

Unmitigated Construction On-Site

Acres of Grading: 0

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					13.5497	0.0000	13.5497	7.4480	0.0000	7.4480			0.0000			0.0000
Off-Road	0.7371	7.9534	5.5448	7.8400e-003		0.4777	0.4777		0.4395	0.4395		822.8132	822.8132	0.2456		827.9717
Total	**0.7371**	**7.9534**	**5.5448**	**7.8400e-003**	**13.5497**	**0.4777**	**14.0274**	**7.4480**	**0.4395**	**7.8875**		**822.8132**	**822.8132**	**0.2456**		**827.9717**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1547	0.0417	0.4874	9.1000e-004	0.0754	6.2000e-004	0.0761	0.0200	5.6000e-004	0.0206		78.7182	78.7182	4.1500e-003		78.8054
Total	**0.1547**	**0.0417**	**0.4874**	**9.1000e-004**	**0.0754**	**6.2000e-004**	**0.0761**	**0.0200**	**5.6000e-004**	**0.0206**		**78.7182**	**78.7182**	**4.1500e-003**		**78.8054**

3.2 Site Preparation - 2015

Mitigated Construction On-Site

Acres of Grading: 0

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					13.5497	0.0000	13.5497	7.4480	0.0000	7.4480			0.0000			0.0000
Off-Road	0.7365	7.9461	5.5397	7.8300e-003		0.4773	0.4773		0.4391	0.4391	0.0000	822.0583	822.0583	0.2454		827.2121
Total	**0.7365**	**7.9461**	**5.5397**	**7.8300e-003**	**13.5497**	**0.4773**	**14.0269**	**7.4480**	**0.4391**	**7.8871**	**0.0000**	**822.0583**	**822.0583**	**0.2454**		**827.2121**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1547	0.0417	0.4874	9.1000e-004	0.0754	6.2000e-004	0.0761	0.0200	5.6000e-004	0.0206		78.7182	78.7182	4.1500e-003		78.8054
Total	**0.1547**	**0.0417**	**0.4874**	**9.1000e-004**	**0.0754**	**6.2000e-004**	**0.0761**	**0.0200**	**5.6000e-004**	**0.0206**		**78.7182**	**78.7182**	**4.1500e-003**		**78.8054**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.1528	0.1219	0.5860	1.0900e-003	0.0767	1.7000e-003	0.0784	0.0204	1.5600e-003	0.0220		97.4160	97.4160	4.2900e-003		97.5062
Unmitigated	0.1528	0.1219	0.5860	1.0900e-003	0.0767	1.7000e-003	0.0784	0.0204	1.5600e-003	0.0220		97.4160	97.4160	4.2900e-003		97.5062

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	17.01	17.01	17.01	36,320	36,320
Total	17.01	17.01	17.01	36,320	36,320

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.552608	0.057937	0.185322	0.124470	0.029726	0.004465	0.012479	0.021685	0.001768	0.001276	0.005971	0.000530	0.001762

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr					lb/day								lb/day			
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category					lb/day								lb/day			
Mitigated	24.5362	1.0000e-005	1.1300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.3400e-003	2.3400e-003	1.0000e-005		2.4800e-003
Unmitigated	24.5362	1.0000e-005	1.1300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.3400e-003	2.3400e-003	1.0000e-005		2.4800e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	14.5617					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	9.9744					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.1000e-004	1.0000e-005	1.1300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.3400e-003	2.3400e-003	1.0000e-005		2.4800e-003
Total	**24.5362**	**1.0000e-005**	**1.1300e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.3400e-003**	**2.3400e-003**	**1.0000e-005**		**2.4800e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	14.5617					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	9.9744					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.1000e-004	1.0000e-005	1.1300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.3400e-003	2.3400e-003	1.0000e-005		2.4800e-003
Total	**24.5362**	**1.0000e-005**	**1.1300e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.3400e-003**	**2.3400e-003**	**1.0000e-005**		**2.4800e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Appendix C

Archaeological Survey Report

Appendix D

MROSD Best Management Practices and Standard Operating Procedures for Routine Maintenance Activities in Water Courses

Regional
OpenSpace | Midpeninsula Regional Open Space District

MIDPENINSULA REGIONAL OPEN SPACE DISTRICT

BEST MANAGEMENT PRACTICIES (BMPs) FOR ROUTINE MAINTENANCE ACTIVITES IN WATER COURSES

Sources

*	California Salmonid Stream habitat Restoration Manual, State of California Resources Agency, Department of Fish and Game (2002)
+	Timothy C. Best, Certified Engineering Geologist (CEG), Engineering Geology and Hydrology, Santa Cruz, California (2006-2012)
^	Erosion Draw 5.0, Bio Draw 3.0, Environmentally-Sensitive Streambank Restoration (ESenSS), John McCullah, Salix Applied Earthcare, Redding California (2004)
°	Midpeninsula Regional Open Space District (2007)

Page #	Source	BMP#	BMP Title	Detail
1	*	1	Characteristics of Storm-proofed Roads	N
2	*	2	Road Upgrading Treatments	N
3	*	3	Culvert and Trash Rack Installation	Y
5	+		Permanent Culvert Typical Specifications	Y
7	+		Embedded Culvert Typical Specifications	Y
9	*	4	Ford and Armored Fill Stream Crossings	Y
10	*		Armored Fill Crossings	Y
11	+		Rock Ford (Road) Typical Specifications	Y
13	+		Rock Ford (Trail) Typical Specifications	Y
14	*	5	Removal of Unstable Sidecast Material	Y
15	+		Perched Fill Removal Typical Specifications	Y
16	*	6	Outsloping Pitch for Roads	N
16	*	7	Ditch Relief Culverts	Y
17	+		Ditch Relief Culverts Typical Specifications	Y
18	+	8	Downspout Typical Specifications	Y
19	+	9	Subdrain	Y
20	*	10	Rolling Dip Installation Instructions	N
21	*		Rolling Dip Specifications	Y
22	+		Reverse Grade Dip, Existing Road/Trail	Y
23	+		Reverse Grade Dip, New Trail Construction	Y
24	+	11	Waterbar Typical Specifications	Y
25	+		Large Waterbar Typical Specifications	Y
26	^	12	Brushlayering with Soil Wrap	Y
30	^	13	Brushlayering with Rock Toe Protection	Y
32	^	14	Brush Mattress (Brush Mat)	Y
37	^	15	Coir Rolls with Brushlayering	Y

40	^	16	Energy Dissapater	Y

42	*		Energy Dissapater Typical Specification	Y
43	^	17	Erosion Control Blankets and Mats	Y
48	^	18	Grass-lined Channels	Y
51	^	19	Instream Diversion Techniques	Y
54	^	20	Instream Isolation Techniques	Y
59	°	21	Large Woody Debris Management and Removal	N
61	^	22	Live Pole Drains	Y
64	^	23	Live Siltation	Y
66	^	24	Modified Live Siltation	Y
68	^	25	Live Staking	Y
71	^	26	Pole Planting	Y
73	^	27	Riprap	Y
76	*	28	Riprap Revetment	Y
77	^	29	Rootwad Revetment with Vegetated Riprap	Y
81	^	30	Silt Fence Installation	Y
85	*		Straw Silt Fence Typical Specifications	Y
86	^	31	Slope Drain	Y
88	^	32	Straw Rolls	Y
90	*		Straw Roll Placement Typical Specifications	Y
91	^	33	Structural Streambank Stabilization	Y
94	^	34	Temporary Diversion Dike	Y
96	^	35	Vegetated Mechanically Stabilized Earth	Y
99	^	36	Vegetated Riprap	Y
106	^	37	Wattle (Live Fascines)	Y
110	*	38	Trail Puncheons	Y
111	*	39	Bridge Abutment Armor	Y
112	*	40	Temporary Splitter Stream Crossing	Y
113	*	41	Knick	Y
114	*	42	Inside Ditch	Y
115	*	43	Trail Cross Slopes	Y
116	*	44	Cross Vane Structure Typical Specifications	Y
117	*	45	Rock Chute/Step Pool Typical Specifications	Y
121	*	46	Log Grade Check Typical Specifications	Y
122	*	47	Erosion Control Notes	N
123	*	48	Crossing Removal	Y
124	*	49	Rock Grade Check Typical Specifications	Y
125	*	50	Wood Grade Check Typical Specifications	Y

Characteristics of Storm-proofed Roads

Storm-proofed stream crossings

- All stream crossings have a drainage structure designed for the 100-year flow (with debris).
- Stream crossings have no diversion potential (functional critical dips are in place).
- Stream crossing inlets have low plug potential (trash barriers & graded drainage).
- Protect stream crossing outlets from erosion (extended, transported or dissipated).
- Culvert inlet, outlet and bottom are open and in sound condition.
- Undersized culverts in deep fills (greater than backhoe reach) have emergency overflow culvert.
- Bridges have stable, non-eroding abutments and do not significantly restrict 100-year flood flow.
- Fills are stable (unstable fills are removed or stabilized).
- Road surfaces and ditches are "disconnected" from streams and stream crossing culverts.
- Class I stream crossings meet DFG and NMFS fish passage criteria (Part IX).

Storm-proofed fills

- Unstable and potentially unstable road and landing fills are excavated or structurally stabilized.
- Excavated spoil is placed in locations where it will not enter a stream.
- Excavated spoil is placed where it will not cause a slope failure or landslide.

Road surface drainage

- Road surfaces and ditches are "disconnected" from streams and stream crossing culverts.
- Ditches are drained frequently by functional rolling dips or ditch relief culverts.
- Outflow from ditch relief culverts does not discharge to streams.
- Gullies (including those below ditch relief culverts) are dewatered to the extent possible.
- Ditches do not discharge (through culverts or rolling dips) onto active or potential landslides.
- Decommissioned roads have permanent drainage and do not rely on ditches
- Fine sediment contributions from roads, cutbanks and ditches are minimized by utilizing seasonal closures and installing a variety of surface drainage techniques including berm removal, road surface shaping (outsloping, insloping or crowning), rolling dips, ditch relief culverts, water bars and other measures to disperse road surface runoff and reduce or eliminate sediment delivery to the stream.

Figure X-9. Common characteristics of storm-proofed roads.

Road Upgrading Treatments

In general, road upgrading consists of stream crossing upgrades, excavation of selected unstable or potential unstable fillslopes, and dispersion of road runoff (Figure X-9).

Stream Crossing Upgrading

- Eliminate stream diversion potential by dipping the entire stream crossing fill or by installing a critical dip (Figure X-13). A critical dip is a rolling dip that is constructed on or close to the down-road hinge line of a stream crossing that displays a diversion potential.
- Upgrade stream crossings by installing culverts sized for the 100-year flood flow, including sufficient capacity for expected wood and sediment (Figure X-I3 and Figure X-14). These requirements are determined by both field observation and calculations using a procedure such as the Rational Formula (PWA 1994). Where necessary, install inlet protection (trash barriers) to prevent culvert plugging on non-fish bearing streams.
- Replace large high-risk culverts with bridges. Consider replacing any culvert greater than 72 inches in diameter with a bridge, especially in Class I streams.
- Replace culverted fills with hardened fords or armored fills (Figure X-15 and Figure X-16) on non-fish bearing streams where regular winter inspections and culvert maintenance is not feasible, or on steep gradient stream crossings where the culvert plug potential will always be high.
- Install armored crossings (Figure X-15 and Figure X-I6) in areas where debris torrents are common, can be expected or where small steep giadient streams cross the road. Almored fill crossings are for sites where it will be very difficult to prevent frequent culvert plugging due to high amounts of transported sediment and debris. The treatment requires excavating the fill in the stream crossing and leaving a very broad dip in the axis of the natural channel, with long and gently sloping ramps into and out of the stream crossing. This treatment may be most appropriate along roads built on a floodplain and terrace, or where roads cross steep gradient stream channels with relatively small depths of fill at the outboard edge of the road.

Excavation of Unstable Fillslope

Remove unstable sidecast and fill materials from steep slopes (Figure X-I7), steep headwater swales, and along road approaches to deeply incised stream channels, where there is potential for sediment delivery.

Stream Crossing Culvert Installation for Non-fish Bearing Streams

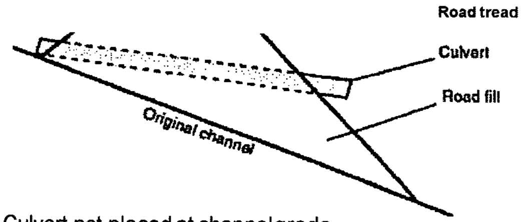
- Align culverts with the natural stream channel orientation to ensure proper function, prevent bank erosion and minimize debris plugging problems.
- Place culverts at the base of the fill and at the grade of the original streambed or install a downspout past the base of the fill (Figure X-14).
- o Culverts should be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
- Culvert beds should be composed of rock-free soil or gravel, evenly distributed under the length of the pipe.
- Compact the base and sidewall material before placing the pipe in its bed.
- To allow for sagging after burial, an upward camber should be between 1.5 to 3 inches per 10 feet culvert pipe length.
- Backfill material should be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around the pipe.
- Cover one end of the culvert pipe, then the other end. Once the ends are secure, cover the center.
- Tamp and compact backfill material throughout the entire process, using water as necessary for compaction.
- Backfill compacting will be done in 0.5-1.0 foot lifts until 1/3 of the diameter of the culvert has been covered (Figure X-14). A gas powered tamper or sheep's foot roller should be used for this work.
- Armor inlets and outlets with rock, or mulch and seed with grass as needed (not all stream crossings need to be armored).
- Install a trash rack (only on non-fish bearing streams) upstream from the culvert inlet where there is a high hazard of floating debris plugging the culvert.
- o Push layers of fill over the crossing to achieve the final design road grade, at a minimum of one-third to one-half the culvert diameter.

Trash Racks

All trash racks require on-going maintenance. Two efficient trash rack designs include:

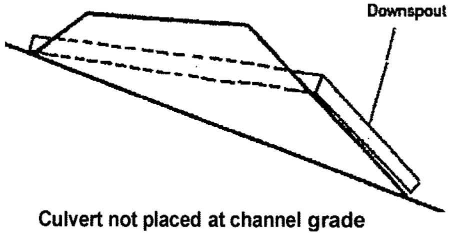
- On streams with culverts 48 inches diameter or greater, build a grate or sieve across the entire channel to collect the large material that would otherwise plug the culvert inlet. Locate the trash rack anywhere from five to 25 feet upstream from the culvert inlet.
- On streams with culverts under 48 inches diameter, set a single post vertically in the steam bed, centered directly upstream from the culvert inlet, and located one culvert diameter distance upstream from the inlet. Size the post and set the post deep into the streambed to withstand the size of woody debris transported by the stream during extreme runoff events.

Existing



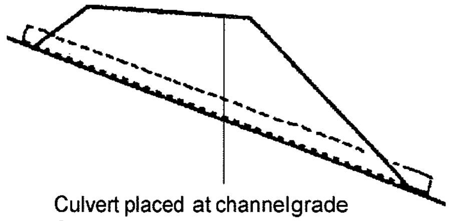
Culvert not placed at channel grade
Culvert **outlet does not extend past base of road fill**

Upgraded



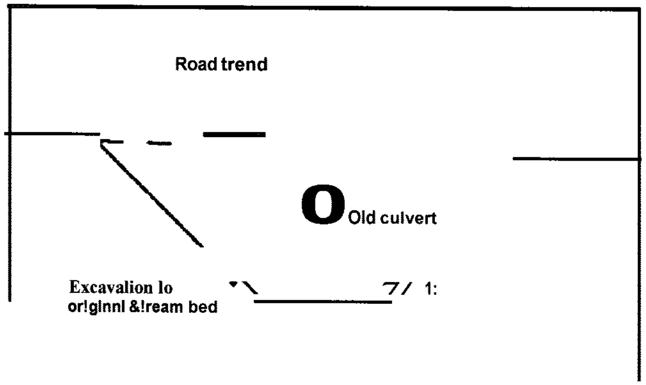
Culvert not placed at channel grade
Downspout added to extend outlet past road fill

Upgraded (preferred design option)

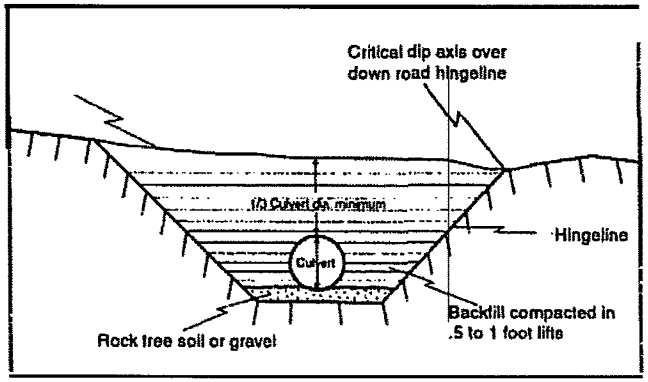


Culvert placed at channel grade
Culvert inlet and outlet resting on or partially in the original stream bed

Excavation in preparation for upgrading culverted stream crossing



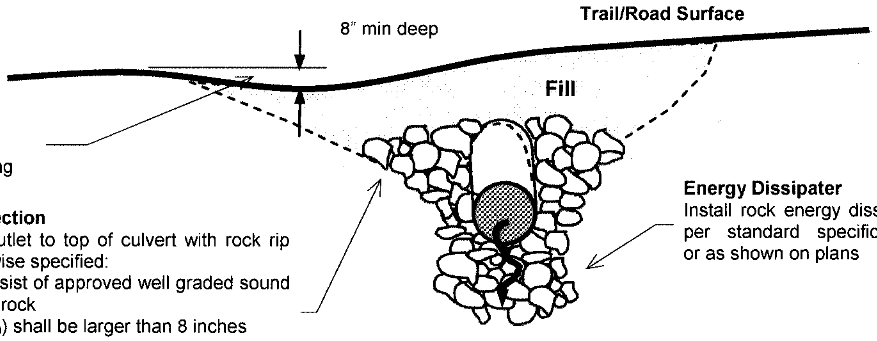
Upgraded stream crossing culvert installation


Critical dip axis over down road hingeline
1/3 Culvert dia. minimum
Hingeline
Culvert
Backfill compacted in .5 to 1 foot lifts
Rock free soil or gravel

5A

PERMANENT CULVERT- RURAL ROAD

NTS

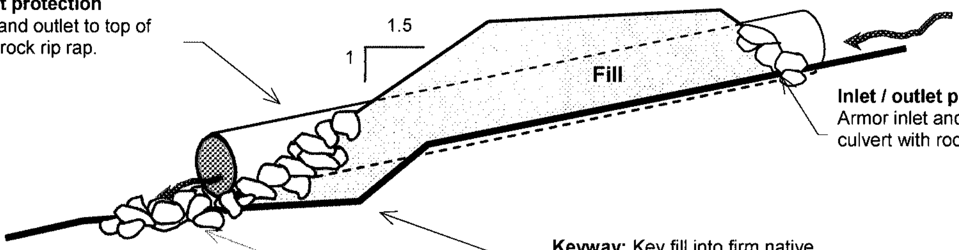


Critical Dip
Install 8" (min) dip on downroad side of crossing

Inlet / outlet protection
Armor inlet and outlet to top of culvert with rock rip rap. Unless otherwise specified:

- Riprap shall consist of approved well graded sound durable angular rock
- 50% of rock (D_{50}) shall be larger than 8 inches minimum diameter
- Rock shall be keyed minimum 1.5 times diameter into bed and banks

Energy Dissipater
Install rock energy dissipater per standard specifications or as shown on plans



Cut culvert flush with armor if directed or specified

Inlet / outlet protection
Armor inlet and outlet to top of culvert with rock rip rap.

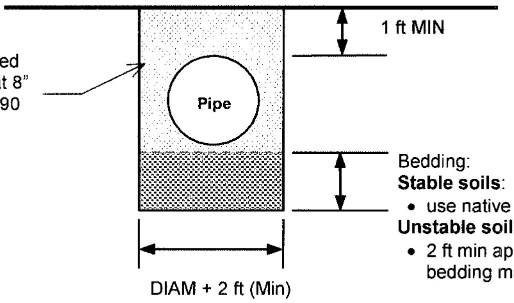
Inlet / outlet protection
Armor inlet and outlet to top of culvert with rock rip rap.

Keyway: Key fill into firm native soils as shown on plans or specified

Energy Dissipater

- Install rock energy dissipater per standard specifications or as shown on plans

Subgrade Surface



Compacted back fill at 8" layers to 90 percent

Bedding:
Stable soils:

- use native

Unstable soils:

- 2 ft min approved bedding material

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PERMANENT CULVERT TYPICAL SPECIFICATIONS

Standard Detail 5A

Date: May 3, 2009

NOTES

- **Culvert Orientation**
  - Culvert should be installed at the natural stream level, grade and orientation
- **Culvert bed**
  - The width of trenches shall permit satisfactory joining and through tamping of the backfill material
  - The culvert bed shall be clean and free of large woody debris and large rocks. Unsuitable material shall be replaced with selected granular foundation material and compacted to obtain uniform bed
  - Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 1 foot and a width of at least 2 feet plus the culvert diameter. This material shall be replaced with selected engineer fill.
  - The inlet to the culvert should be a countersunk 10% of the pipe diameter below stream grade so that the water falls into the culvert inlet.
- **Laying Pipe**
  - Culvert shall be laid in center of trench on uniform grade line to conform to the flow line of the stream. The entire length of pipe shall be in contact with the culvert bedding
  - Unless otherwise specified, the culvert shall have a minimum grade of 2%.
  - Culvert shall be joined and anchored per manufactures guidelines
- **Backfill**
  - Fill shall be keyed and bench into firm native soils. Areas to receive fill shall be stripped to remove vegetation, near surface roots, brush, highly organic soils and other unsuitable fill material.
  - Select mineral soil shall be used for culvert back fill. The back fill shall have no rocks greater than 3 inches in any dimensions placed closer than 1 foot to the culvert.
  - Backfill shall be adequately compacted throughout the entire process to a degree greater than the surrounding materials (approximately 85 percent relative compaction). During placement and compaction of fill, the moisture content of the materials being placed shall be maintained.
  - Fill shall be brought up to grade at a 1.5:1 slope unless otherwise specified
- **Culverts**
  - Culverts shall be smooth bore, double wall (ASTM D3350 and AASHTO M294, Type S)
  - Culverts distorted more than 10% of normal dimension, ruptured or broken shall be replaced
  - Culverts shall be cut flush with armored embankment/headwall if directed or specified
- **Inlet/outlet protection**
  - Armor inlet and outlet to top of culvert with rock rip rap
  - Riprap shall consist of approved well graded sound durable angular rock unless otherwise specified
  - 50% of rock (D_{50}) shall be larger than 8 inches minimum diameter unless otherwise specified
  - Rock shall be keyed minimum 1.5 times diameter into bed and banks unless otherwise specified
- **Energy dissipater**
  - Culvert shall discharge onto rock apron per general specifications
- **Erosion Control**
  - On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
  - Critical dip (8" min) shall be installed on the down road side of crossing
  - Exposed soils shall be mulched per standard specification. Install coir roll at base of exposed soils
- **Department of Fish and Game Agreement**
  - Conform to Department of Fish and Game 1600 agreement where applicable

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PERMANENT CULVERT NOTES
TYPICAL SPECIFICATIONS

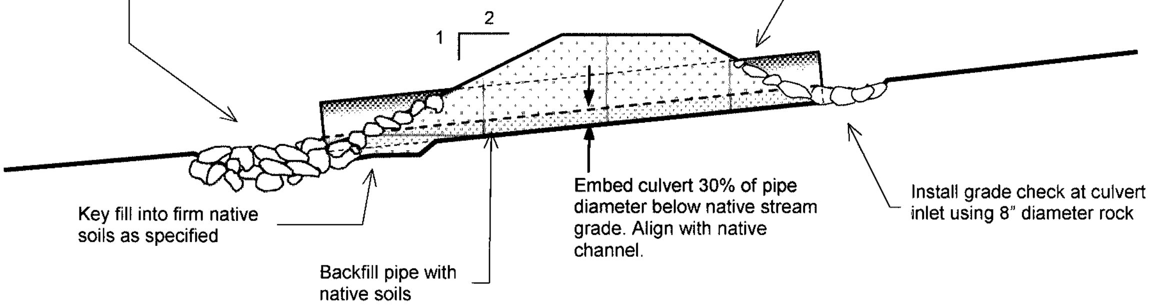
Standard Detail 5A

Date: May 3, 2009

5B

EMBEDDED CULVERT

NTS



Energy Dissipater
- Install rock energy dissipater per standard specifications or as shown on plans

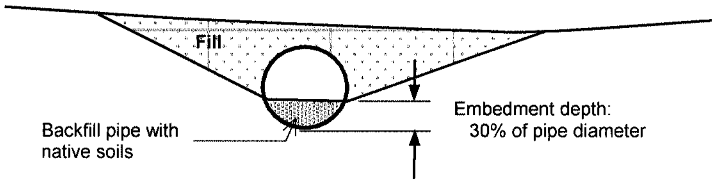
Inlet / outlet protection
Armor inlet and outlet to top of culvert with rock rip rap.

Key fill into firm native soils as specified

Backfill pipe with native soils

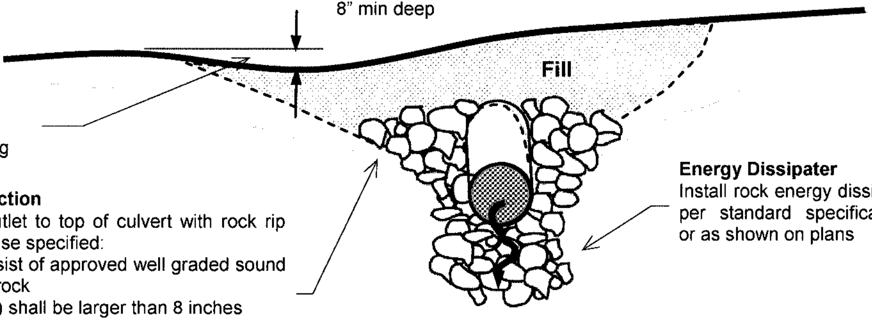
Embed culvert 30% of pipe diameter below native stream grade. Align with native channel.

Install grade check at culvert inlet using 8" diameter rock



Backfill pipe with native soils

Embedment depth:
30% of pipe diameter



8" min deep

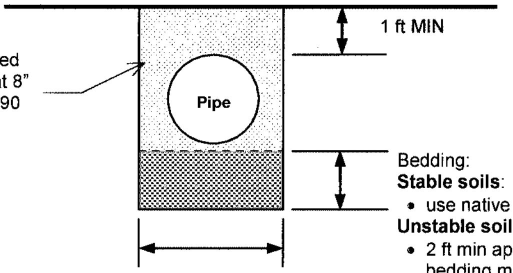
Trail/Road Surface

Critical Dip
Install 8" (min) dip on downroad side of crossing

Inlet / outlet protection
Armor inlet and outlet to top of culvert with rock rip rap. Unless otherwise specified:
- Riprap shall consist of approved well graded sound durable angular rock
- 50% of rock (D_{50}) shall be larger than 8 inches minimum diameter
- Rock shall be keyed minimum 1.5 times diameter into bed and banks

Energy Dissipater
Install rock energy dissipater per standard specifications or as shown on plans

Subgrade Surface



Compacted back fill at 8" layers to 90 percent

1 ft MIN

Bedding:
Stable soils:
- use native

Unstable soils:
- 2 ft min approved bedding material

DIAM + 2 ft (Min)

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EMBEDDED CULVERT
TYPICAL SPECIFICATIONS

Standard Detail 5B

Date: May 3, 2009

NOTES

- **Culvert Orientation**
  - Culvert should be installed at the natural stream level, grade and orientation

- **Culvert bed**
  - The width of trenches shall permit satisfactory joining and through tamping of the backfill material
  - The culvert bed shall be clean and free of large woody debris and large rocks. Unsuitable material shall be replaced with selected granular foundation material and compacted to obtain uniform bed
  - Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 1 foot and a width of at least 2 feet plus the culvert diameter. This material shall be replaced with selected engineer fill.
  - The bottom of the culvert shall be buried (embedded) into the native channel not less than 30%

- **Laying Pipe**
  - Culvert shall be laid in center of trench on uniform grade line to conform to the flow line of the stream. The entire length of pipe shall be in contact with the culvert bedding
  - The bottom of the culvert shall be buried (embedded) into the native channel not less than 30% of the culvert diameter and backfilled with approved native soil
  - Culvert shall be joined and anchored per manufactures guidelines

- **Backfill**
  - Fill shall be keyed and bench into firm native soils. Areas to receive fill shall be stripped to remove vegetation, near surface roots, brush, highly organic soils and other unsuitable fill material.
  - Select mineral soil shall be used for culvert back fill. The back fill shall have no rocks greater than 3 inches in any dimensions placed closer than 1 foot to the culvert.
  - Backfill shall be adequately compacted throughout the entire process to a degree greater than the surrounding materials (approximately 85 percent relative compaction). During placement and compaction of fill, the moisture content of the materials being placed shall be maintained.
  - Fill shall be brought up to grade at a 1.5:1 slope unless otherwise specified

- **Culverts**
  - Culverts shall be smooth bore, double wall (ASTM D3350 and AASHTO M294, Type S)
  - Culverts distorted more than 10% of normal dimension, ruptured or broken shall be replaced
  - Culverts shall be cut flush with armored embankment/headwall if directed or specified

- **Inlet/outlet protection**
  - Armor inlet and outlet to top of culvert with rock rip rap
  - Riprap shall consist of approved well graded sound durable angular rock unless otherwise specified
  - 50% of rock (D_{50}) shall be larger than 8 inches minimum diameter unless otherwise specified
  - Rock shall be keyed minimum 1.5 times diameter into bed and banks unless otherwise specified
  - Install rock grade check at culvert inlet using 8 inch minimum diameter rock. Extend rock 2 times culvert diamter upstream.

- **Energy dissipater**
  - Culvert shall discharge onto rock apron per general specifications

- **Erosion Control**
  - On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
  - Critical dip (8" min) shall be installed on the down road side of crossing
  - Exposed soils shall be mulched per standard specification. Install coir roll at base of exposed soils

- **Department of Fish and Game Agreement**
  - Conform to Department of Fish and Game 1600 agreement where applicable

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EMBEDDED CULVERT NOTES
TYPICAL SPECIFICATIONS

Standard Detail 5B

Date: May 3, 2009

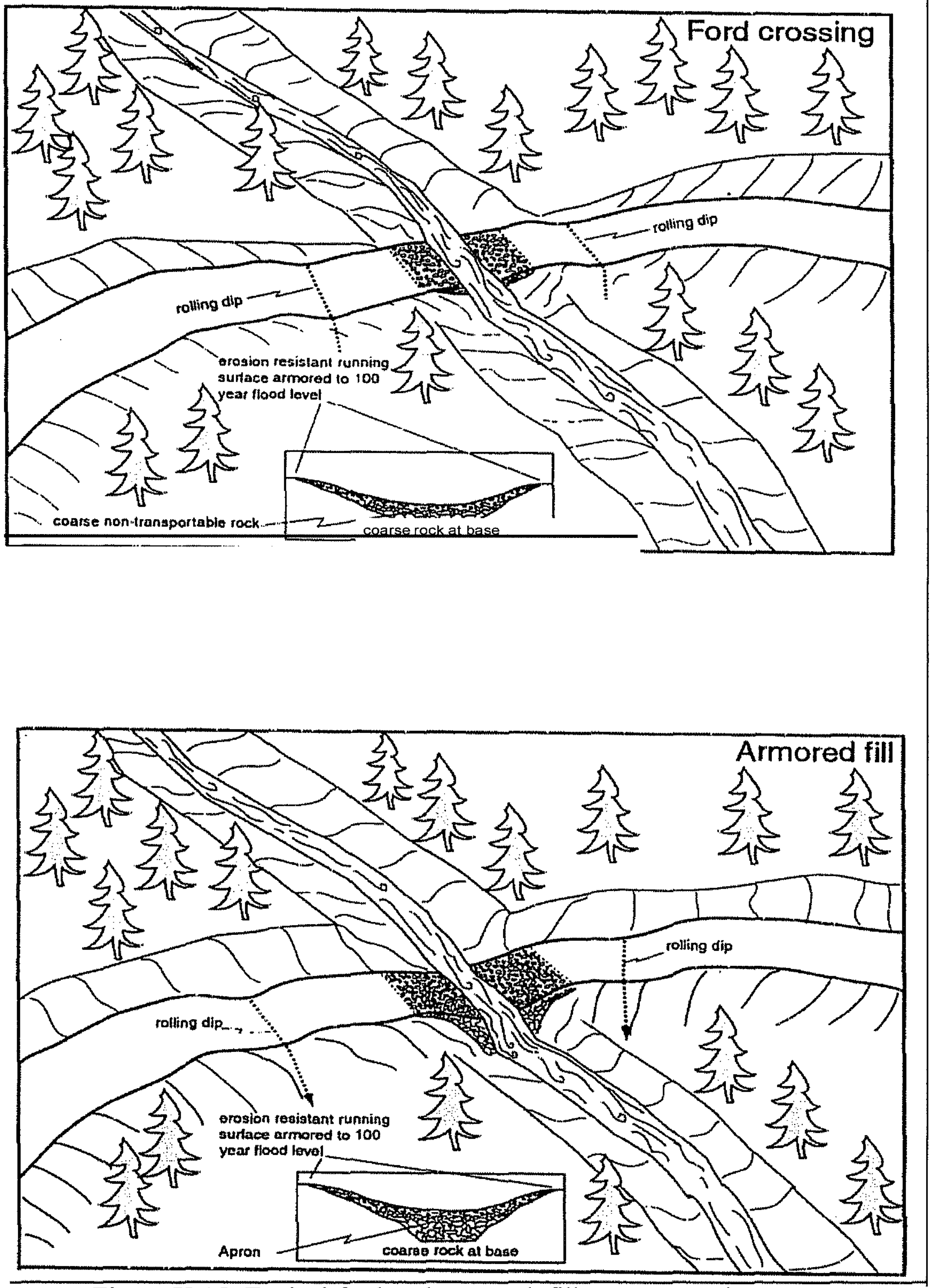
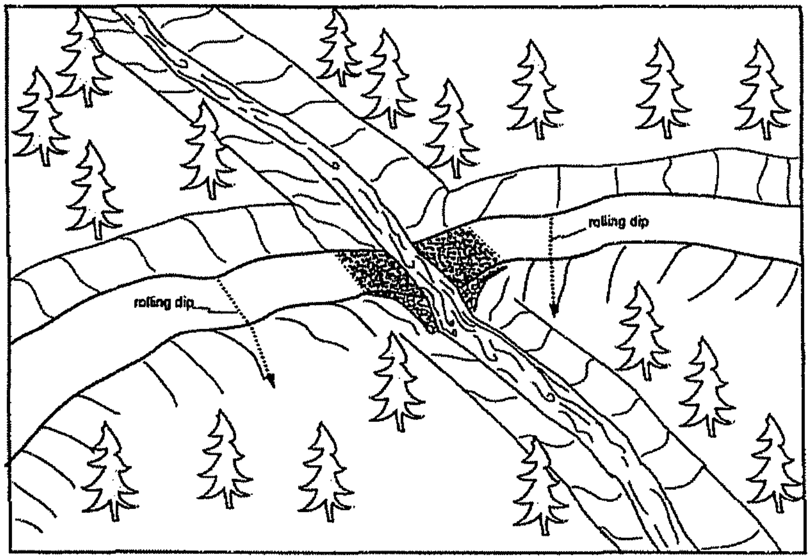
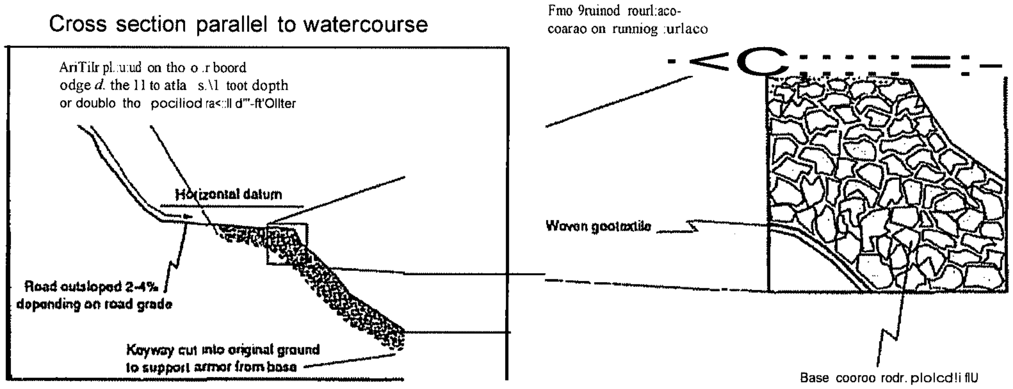

Ford crossing
rolling dip
rolling dip
erosion resistant running surface armored to 100 year flood level
coarse non-transportable rock
coarse rock at base
Armored fill
rolling dip
rolling dip
erosion resistant running surface armored to 100 year flood level
Apron
coarse rock at base

Figure X-15. Typical ford and armored fill stream crossings.



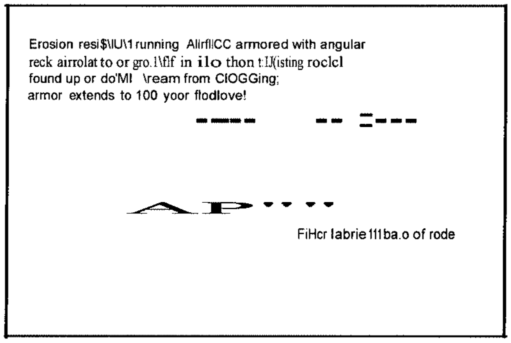
Cross section parallel to watercourse


AriTilr pl.:u:ud on tho o .r boord odge *d.* the 11 to atla s.\1 toot dopth or doublo tho pociliod ra<::ll d'"-ft'Ollter

Fmo 9ruinod rourl:aco-coarao on runniog :urlaco

Horizontal datum
Road outsloped 2-4% depending on road grade
Keyway cut into original ground to support armor from base
Woven geotextile
Base cooroo rodr. ploIcd!i flU

Cross section perpendicular to watercourse

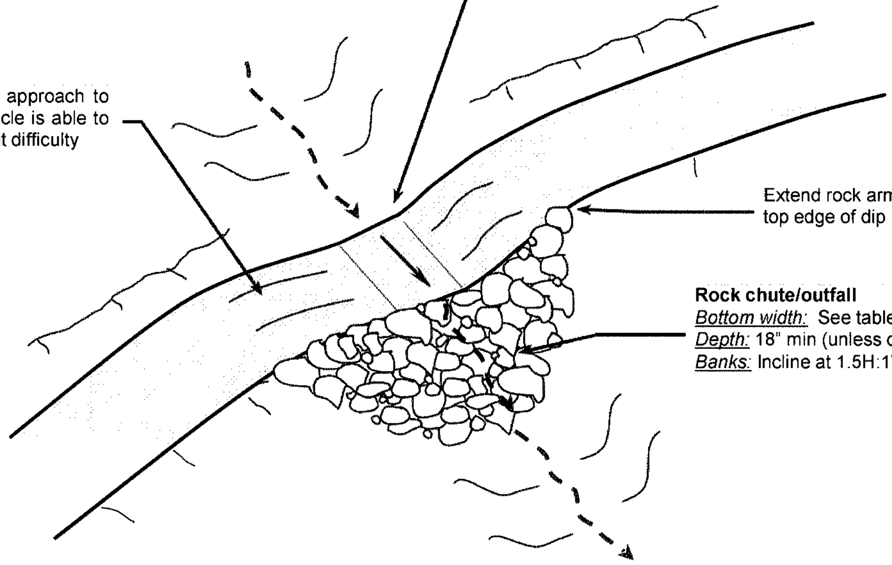

Erosion resi$\IU\1 running AllrfllCC armored with angular reck airrolat to or gro.1\flf in ilo thon t:IJ(isting roclcl found up or do'MI \ream from ClOGGing; armor extends to 100 yoor flodlove!

Note: Where geotextile fabric may interfere with passage of amphibians in any Class 2 or 3 crossing, bury geotextile fabric with at least 6 inches of rock. Do not use geotextile fabric in fish-bearing streams.

Figure X-16. Installation and specification of typical ar·mored fill crossing.

5C ROCK FORD – FOREST ROAD

NTS



Road Dip
Bottom width: See table
Depth: 12" *min (unless otherwise specified)*
Flat channel bottom with 3% outslope

Taper road approach to ensure vehicle is able to pass without difficulty

Extend rock armor to top edge of dip

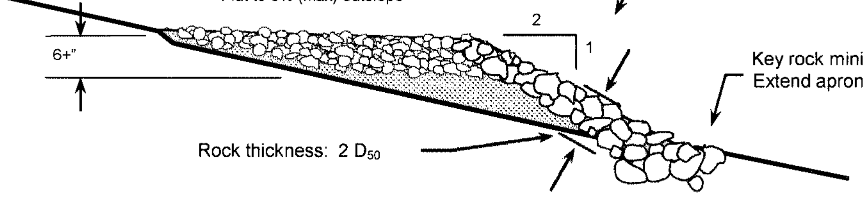
Rock chute/outfall
Bottom width: See table
Depth: 18" min (unless otherwise specified)
Banks: Incline at 1.5H:1V (max)

AGGREGATE ROAD BASE:

- See table for rock size
- Place rock minimum 6" deep
- *Note: If specified separate base from native with woven geotextile fabric (Mirifi 700X or equivalent)*

OUTFALL ARMOR:

- See table for D_{50} rock size *(unless otherwise specified).*
- Rock rip-rap shall consist of approved sound durable angular rock
- Rock should generally be well graded (incorporating mix of sizes: See table for range)
- Voids shall be filled with smaller rock to prevent piping around the larger rock.
- Larger rock to be placed at base of apron
- $2D_{50}$ minimum rock thickness
- Incline no steeper than 2H:1V



Flat to 3% (max) outslope

Key rock minimum of 12" into native soils
Extend apron downstream for distance 3 D_{50}

Rock thickness: 2 D_{50}

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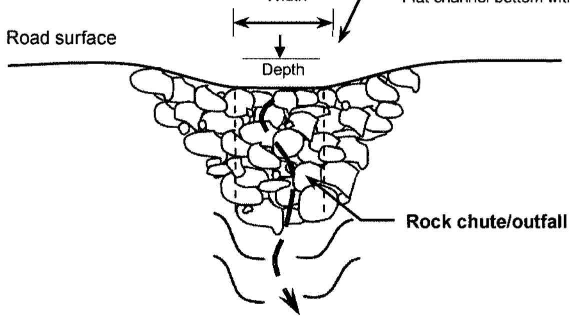
ROCK FORD – FOREST ROAD TYPICAL SPECIFICATIONS

Standard Detail 5C-1

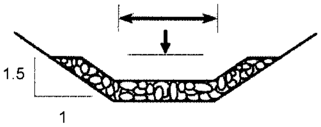
Date: February 22, 2012

Road Section



Road Dip
Bottom width: See table
Depth: 12" min unless otherwise specified
Flat channel bottom with 3% outslope

Chute section



Rock chute/outfall
Bottom width: See table
Depth: 18" min (unless otherwise specified)
Banks: Incline at 1.5H:1V (max)

TABLE 1
CHANNEL WIDTH AND ROCK SIZE

Peak Discharge Q (Cfs)	Minimum Channel Bottom Width (ft)	Rock Chute/outfall		Road surface
		Median rock diameter D_{50} (in)	Range $D_{10} - D_{85}$ (in)	Median Rock diameter D_{50} (in)
2	2′	6″	5″ - 8″	3″ minus
5	2′	9″	6″ - 12″	3″ minus
10	2′	12″	10″ - 16″	3″ minus
15	2′	14″	10″ - 18″	3″ minus
20	4′	14″	10″ - 18″	3″ minus
30	4′	16″	12″ - 20″	3″ – 6″
40	4′	18″	12″ - 24″	3″ – 6″
>40	Site specific design required			

NOTE

- **Details are typical and intended for use as a guideline. Adjustments may be required to local site conditions.**
- **It is the responsibility of the RPF or design professional to ensure the applicability of these specifications at any given site.**
- Specifications apply to low to moderate gradient watercourses where the outfall of the ford is inclined no steeper than 2H:1V (50%) and where the maximum discharge is less than 40 cfs.
- Rock fords are not recommended on roads steeper than 15% grade due to the difficulty in installing an adequate sized dip.
- The design specifications here are based on *Design of Rock Chutes* (Robinson et al., 1998), US Forest Service publications *Low-water Crossings: Geomorphic, Biologic and Engineering Design Considerations* (Clarkin et al., 2006) and *Low-Volume Roads Engineering: Best Management Field Guide* (Keller and Sherar, 2003),

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ROCK FORD – FOREST ROAD TYPICAL SPECIFICATIONS

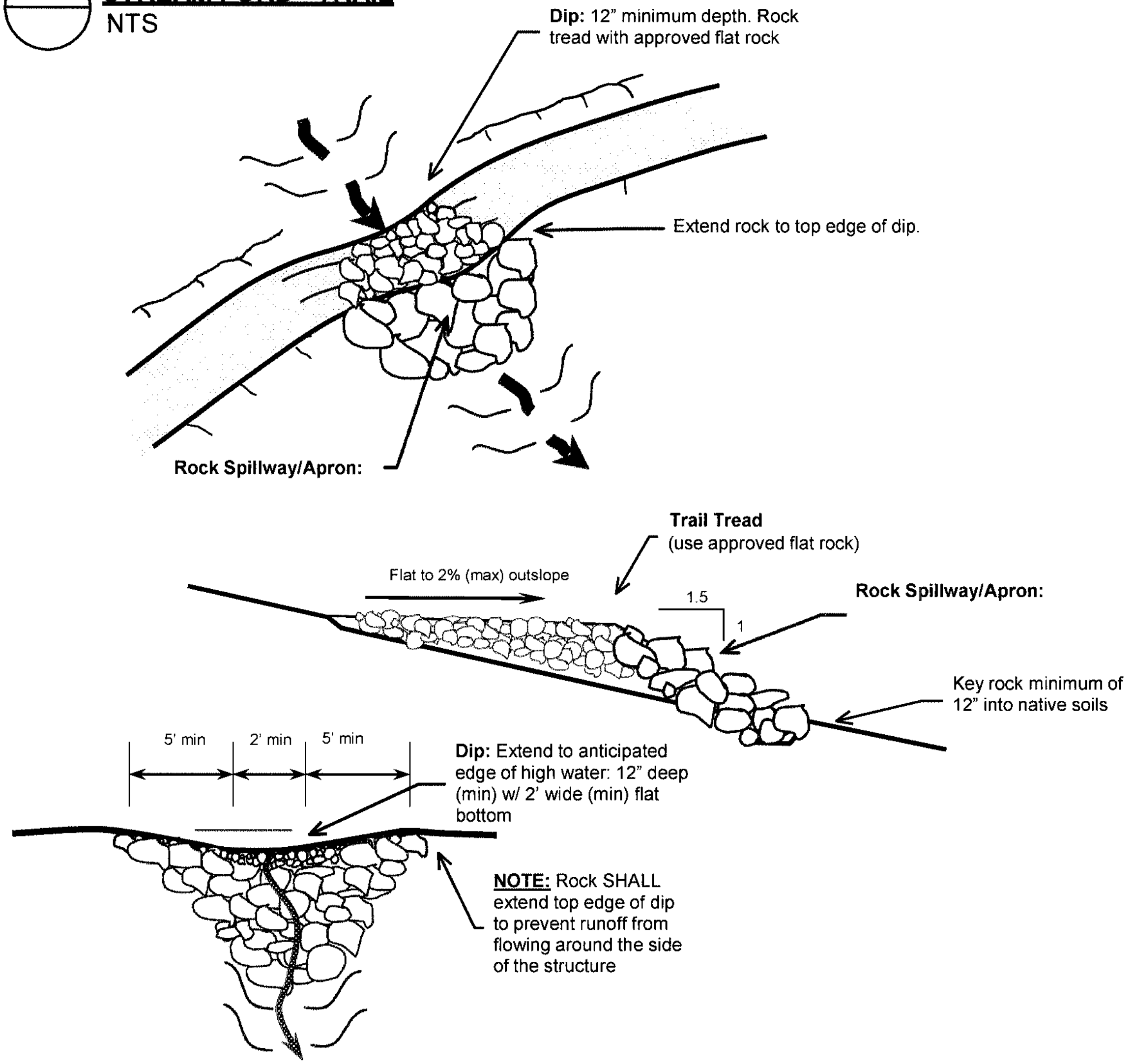
Standard Detail 5C-2

Date: February 22, 2012

5D

STREAM FORD - TRAIL

NTS


Dip: 12" minimum depth. Rock tread with approved flat rock
Extend rock to top edge of dip.
Rock Spillway/Apron:
Trail Tread
(use approved flat rock)
Flat to 2% (max) outslope
1.5
1
Rock Spillway/Apron:
Key rock minimum of 12" into native soils
5' min
2' min
5' min
Dip: Extend to anticipated edge of high water: 12" deep (min) w/ 2' wide (min) flat bottom
NOTE: Rock SHALL extend top edge of dip to prevent runoff from flowing around the side of the structure

NOTES

- Construct trail to dip through watercourse.
  - Dip to extend to anticipated edge of high water
  - Minimum1 2 inches deep and 4 feet wide unless otherwise specified or directed
  - Establish well defined spillway at dip outlet
- Armor outside trail edge with rock to form apron in the spillway
  - Rock shall consist of approved sound durable angular rock
  - 50% (D_{50}) of rock shall be greater than 18 inches minimum diameter *(unless otherwise specified)*
  - Rock should generally be well graded (incorporating mix of sizes)
  - Voids shall be filled with smaller rock to prevent piping around the larger rock
  - Larger rock to be placed at base of apron
  - Extend rock to top edge of dip or above anticipated edge of high water to prevent high flows from eroding around the edge of the rock. Place rock to form a well defined spillway.
  - Rock to be placed no steeper than 1.5:1
- Armor trail tread with rock
  - Use 6" or larger diameter sound durable rock (unless otherwise specified). Place flat to create even trail tread
  - Backfill with compacted soil or base rock for smooth tread surface.
- Specifications are intended only as guideline, modifications may be made in the field by geotechnical consultant or designee

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ROCK FORD - TRAIL
TYPICAL SPECIFICATIONS

Standard Detail 5D

Date: November 29, 2011

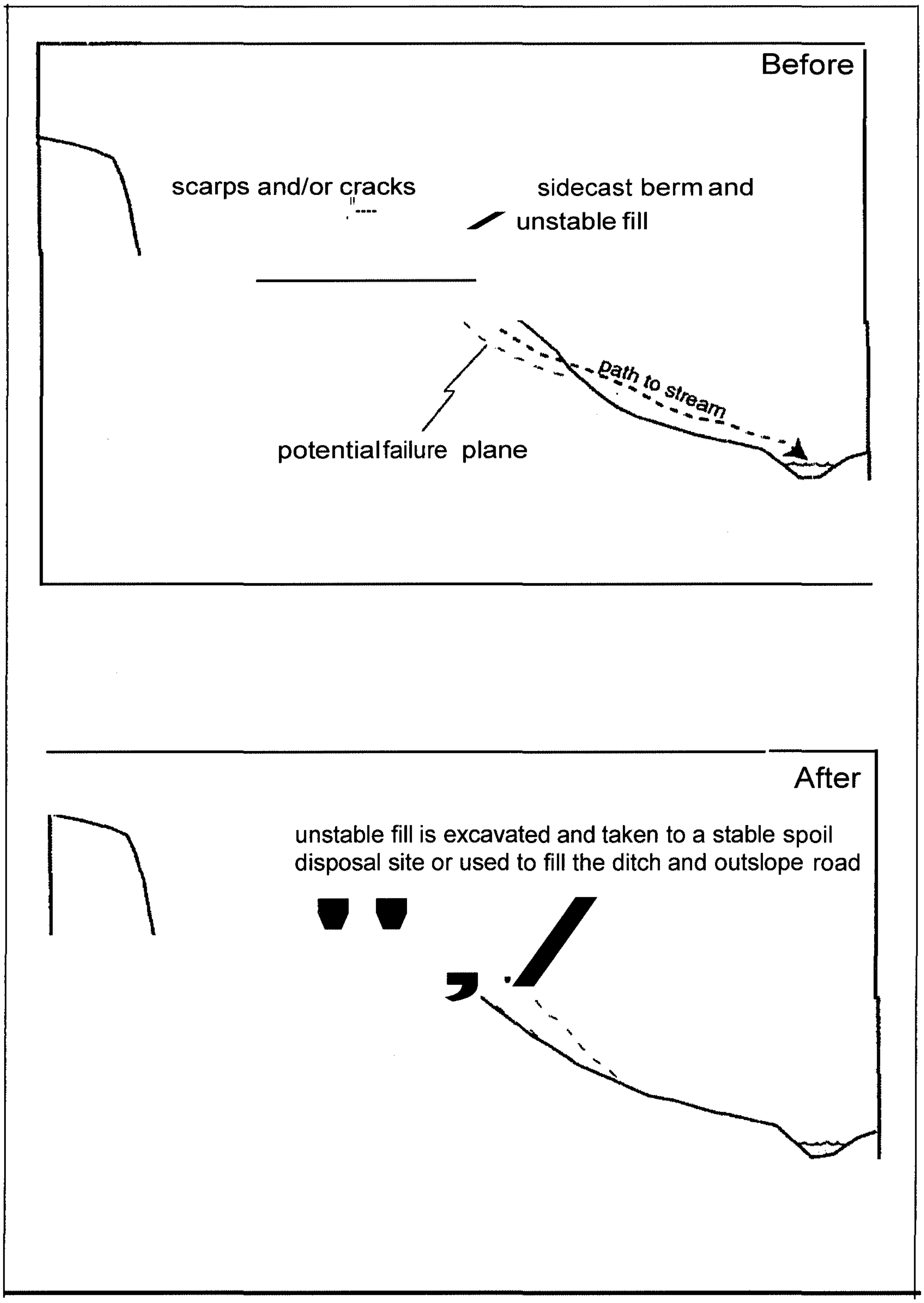
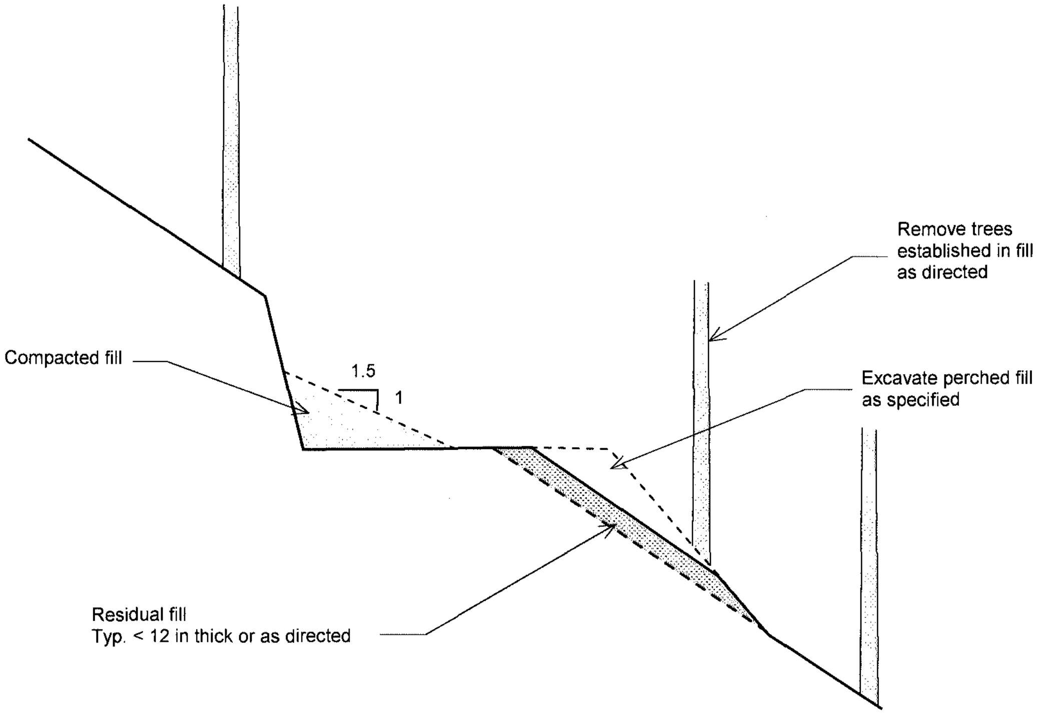

Before
scarps and/or cracks
sidecast berm and unstable fill
path to stream
potential failure plane
After
unstable fill is excavated and taken to a stable spoil disposal site or used to fill the ditch and outslope road

Figure X-17. Removal of unstable sidecast materials.



NOTES

- Remove trees established in roadway and in fill as directed
  - Trees greater than 6 inch diameter shall be marked by District prior to removal
- Excavate perched fill as specified and directed
  - Limits of fill removal to be identified in the field by project geologist or designee
- Spoils shall be compacted along inboard edge of road
  - Spoils shall not be placed in any areas where seasonal bank seeps or wet areas are present
  - Areas to receive fill shall be cleared of vegetation
  - Spoils shall be placed in thin lifts not to exceed 8 inches in maximum thickness and compacted (minimum 85 percent relative compaction). Compacting may include track walking with a dozer, bucket of the excavator, roller or hand tamper. Spoils may need to be moisture conditioned to achieve a suitable level of compaction.
  - Spoils shall be placed a maximum of 5 feet deep with an embankment face inclined no steeper than 1.5:1 (65%) unless otherwise directed or specified
  - Project geotechnical consultant or designee shall approve all spoil sites prior to fill placement
- Specifications are indented only as guideline, modifications may be made in the field by project geotechnical consultant or designee

9A **PERCHED FILL REMOVAL**
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PERCHED FILL REMOVAL
TYPICAL SPECIFICATIONS

Standard Detail 9A

Date: May 3, 2009

Outsloping pitch for roads up to 12% grade		
Road Grade	Outslope Pitch forUnsurfaced roads	Outslope Pitch for Surfaced Roads
4% or less	3/8" per foot	*Vz"* per foot
5%	W'perfoot	5/8" per foot
6%	5/8" per foot	%"per foot
7%	%"per foot	7/8" per foot
12% or more	1" per foot	I-1/4" per foot

Table X-6. Outsloping pitch for roads up to 12% grade.

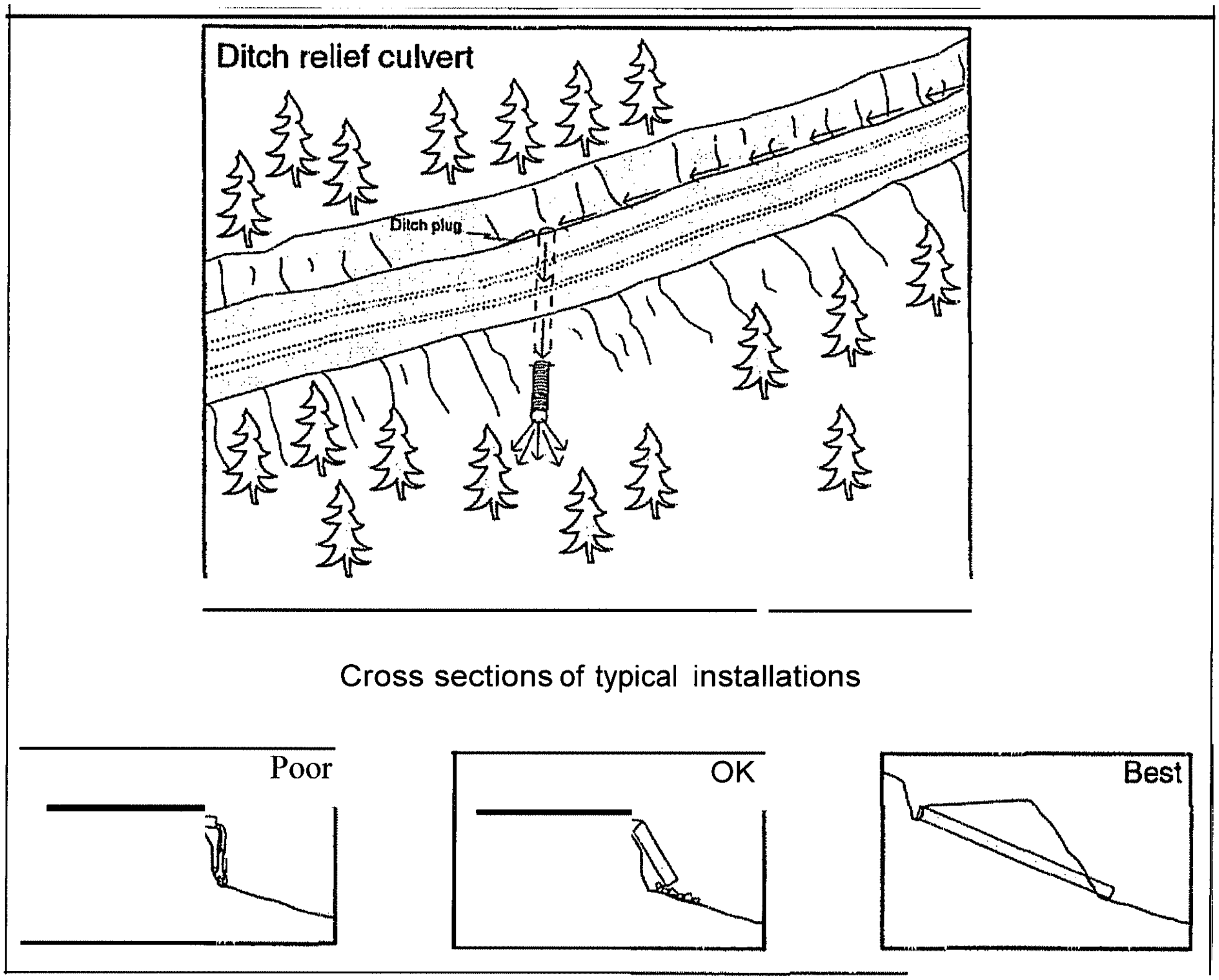
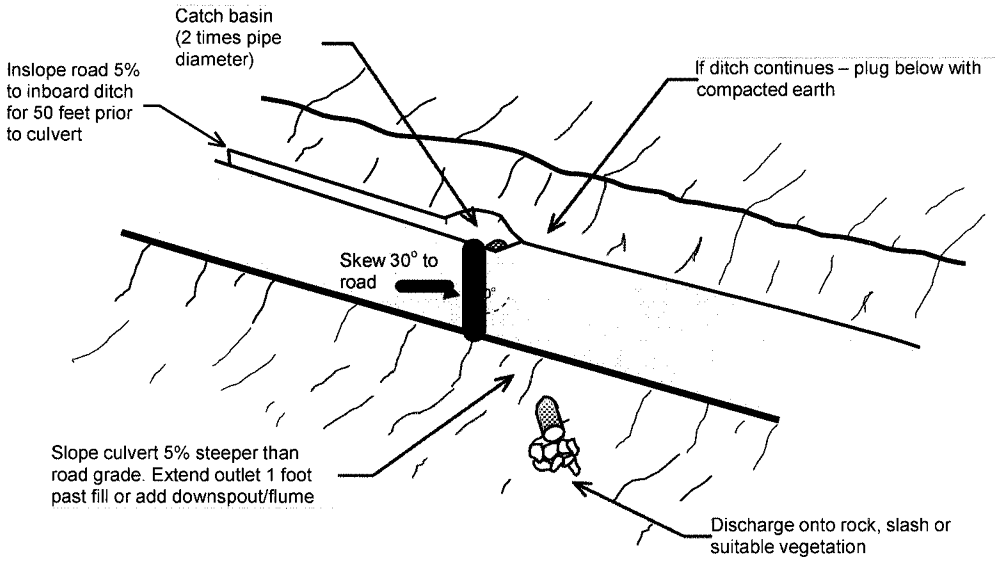
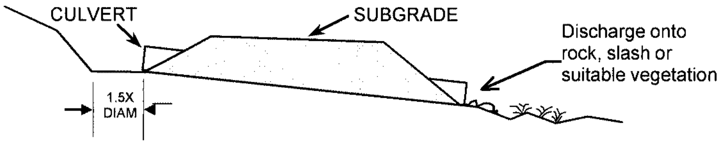
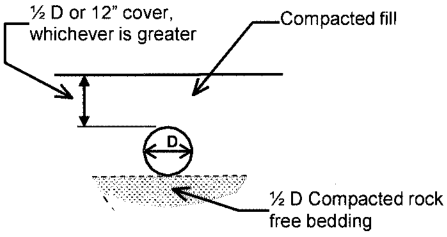


Figure X-19. Typical ditch relief culvert installation.

{0


Catch basin (2 times pipe diameter)
Inslope road 5% to inboard ditch for 50 feet prior to culvert
If ditch continues – plug below with compacted earth
Skew 30° to road
Slope culvert 5% steeper than road grade. Extend outlet 1 foot past fill or add downspout/flume
Discharge onto rock, slash or suitable vegetation




½ D or 12" cover, whichever is greater
Compacted fill
D
½ D Compacted rock free bedding

NOTES

- Ditch relief culverts shall be installed flagged locations or as identified on plans. The maximum spacing of culverts shall be 150 feet unless otherwise specified or directed.
- Culverts shall be 12-inch diameter smooth bore, double wall HDPE (ASTM D3350 and AASHTO M294, Type S) unless otherwise specified
- The culverts shall be placed at a 30 degree skew angle down grade (where allowable) with a gradient 5% steeper than that of the road. Culverts should extend a minimum of 1' beyond base of road fill.
- Where necessary, outlet ditch shall be constructed at a steeper gradient than the culvert, at least one pipe diameter in width, and with bank tapered back to a 1:1 slope.
- The culvert bed shall ½ diameter of the culvert and be clean and free of large woody debris and large rocks. Trench shall be adequate width to facilitate compaction.
- Select approved mineral soil shall be used for culvert back fill. The back fill shall have no rocks greater than 3 inches in any dimensions placed closer than 1 foot to the culvert. Backfill shall be adequately compacted throughout the entire process to 95 percent ASTM 1557 unless otherwise specified. During placement and compaction of fill, the moisture content of the materials being placed shall be maintained.
- Compacted fill coverage shall be minimum ½ pipe diameter or 12 inches, whichever is greater
- Rock, slash or suitable vegetation should be used at discharge point as directed or specified
- A ditch block shall be placed immediately downslope of the culvert intake to prevent ditch flow from bypassing the pipe inlet.
- Specifications are intended only as guideline, modifications may be made in the field by geotechnical consultant or designee

6D DITCH RELIEF CULVERT (Typical)

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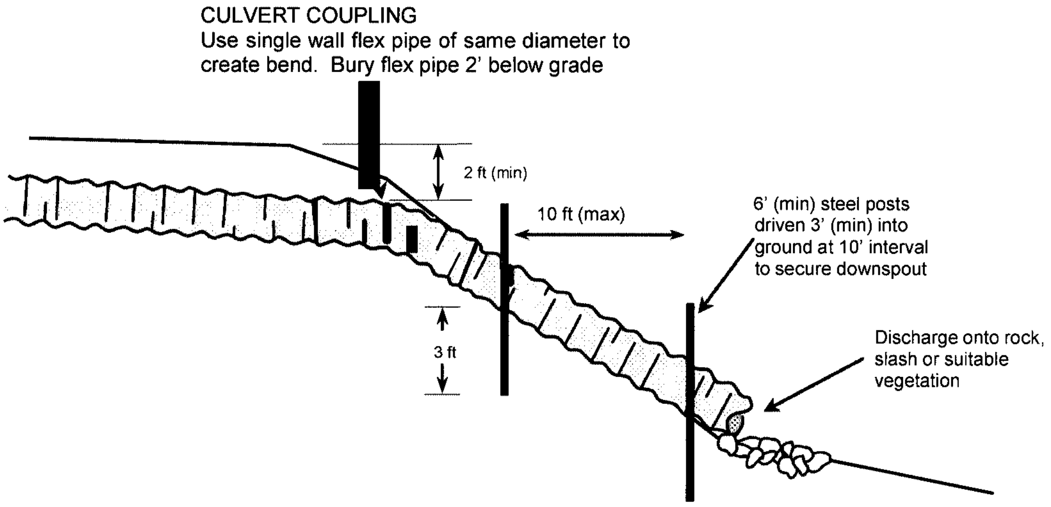
DITCH RELIEF CULVERT
TYPICAL SPECIFICATIONS

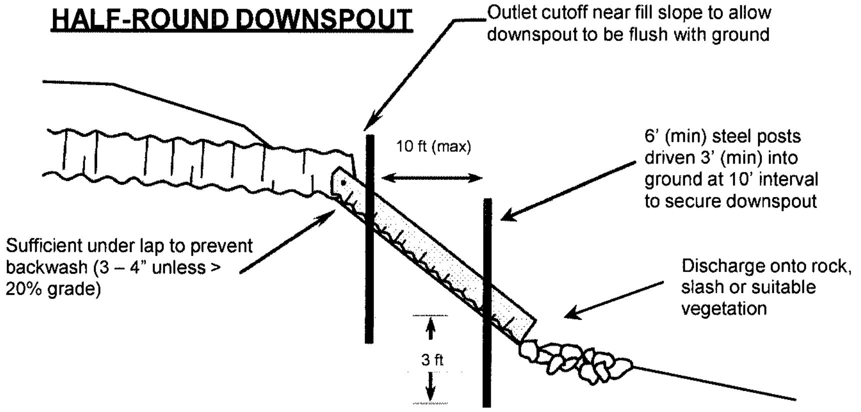
Standard Detail 6D

Date: May 3, 2009

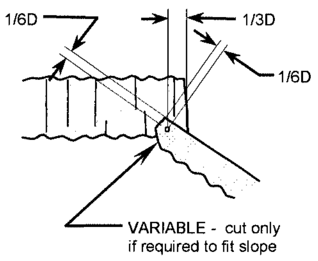
FULL-ROUND DOWNSPOUT


CULVERT COUPLING
Use single wall flex pipe of same diameter to create bend. Bury flex pipe 2' below grade
2 ft (min)
10 ft (max)
6' (min) steel posts driven 3' (min) into ground at 10' interval to secure downspout
3 ft
Discharge onto rock, slash or suitable vegetation

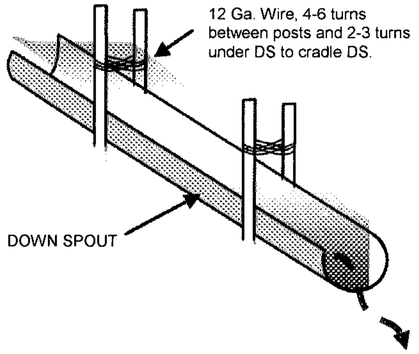
HALF-ROUND DOWNSPOUT


Outlet cutoff near fill slope to allow downspout to be flush with ground
10 ft (max)
6' (min) steel posts driven 3' (min) into ground at 10' interval to secure downspout
Sufficient under lap to prevent backwash (3 – 4" unless > 20% grade)
Discharge onto rock, slash or suitable vegetation
3 ft

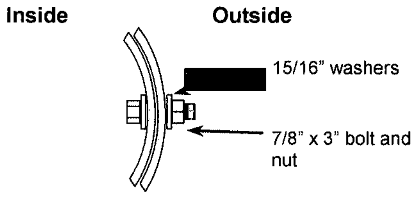
HALF ROUND CONNECTION



DOWNSPOUT STAKE WIRING DETAIL


12 Ga. Wire, 4-6 turns between posts and 2-3 turns under DS to cradle DS.
DOWN SPOUT

BOLT DETAIL



5G

DOWNSPOUT STANDARD PLAN

NTS

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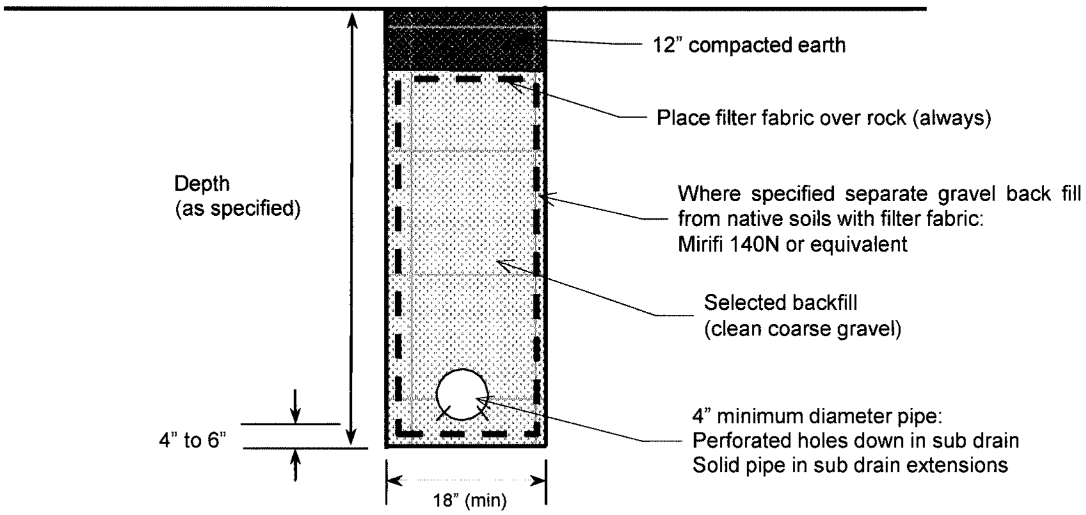
DOWNSPOUT
TYPICAL SPECIFICATIONS

Standard Detail 5G

Date: March 9, 2009


12” compacted earth
Place filter fabric over rock (always)
Depth
(as specified)
Where specified separate gravel back fill from native soils with filter fabric:
Mirifi 140N or equivalent
Selected backfill
(clean coarse gravel)
4” to 6”
4” minimum diameter pipe:
Perforated holes down in sub drain
Solid pipe in sub drain extensions
18” (min)

NOTES

- Excavate 12+” wide trench as specified. Trench should have positive gradient to discharge point.
- Where specified, line trench with approved filter fabric (Mirifi 180N or equivalent)
- Place perforated pipe 4” to 6” from bottom of trench. Solid pipe should extend from trench to discharge point.
- Back fill trench with clean coarse gravel to within 12” of grade
- Place fabric over top of gravel back fill
- Cap with 12” of compacted earth
- Discharge in a reasonable and controlled manner

6G **SUBDRAIN (Typical)**

NTS

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Dispersion of Road Runoff

Disperse and disconnect road surface runoff from streams" Road cutbanks and road ditches are known to deliver substantial volumes of fine sediment to streams in some watersheds (e"g., Reid 1981; Reid and Dunne 1984) and they have been found to significantly affect watershed hydrology (Wemple 1994)" Relatively simple treatments can be performed to upgrade road drainage systems to significantly reduce or largely eliminate this source of fine sediment delivery to streams" Sediment may be minimized by utilizing seasonal closures or traffic restrictions, and dispersing road runoff. Choose from a variety or combination of surface drainage techniques including berm removal, water bars (Figure X-10), road surface shaping (outsloping, insloping or crowning (Figure X-18 and Table X-6), ditch relief culverts (Figure X-19), rolling dips (Figure X-20), and other measures that effectively disperse road surface runoff and reduce or eliminate sediment delivery to the stream. To be effective, they must effectively disperse most road runoff and ditch flow before it reaches the stream" It is critical that all road surface drainage techniques effectively drain the road surface and be drivable for the expected traffic.

Road Upgrading Installation Instructions

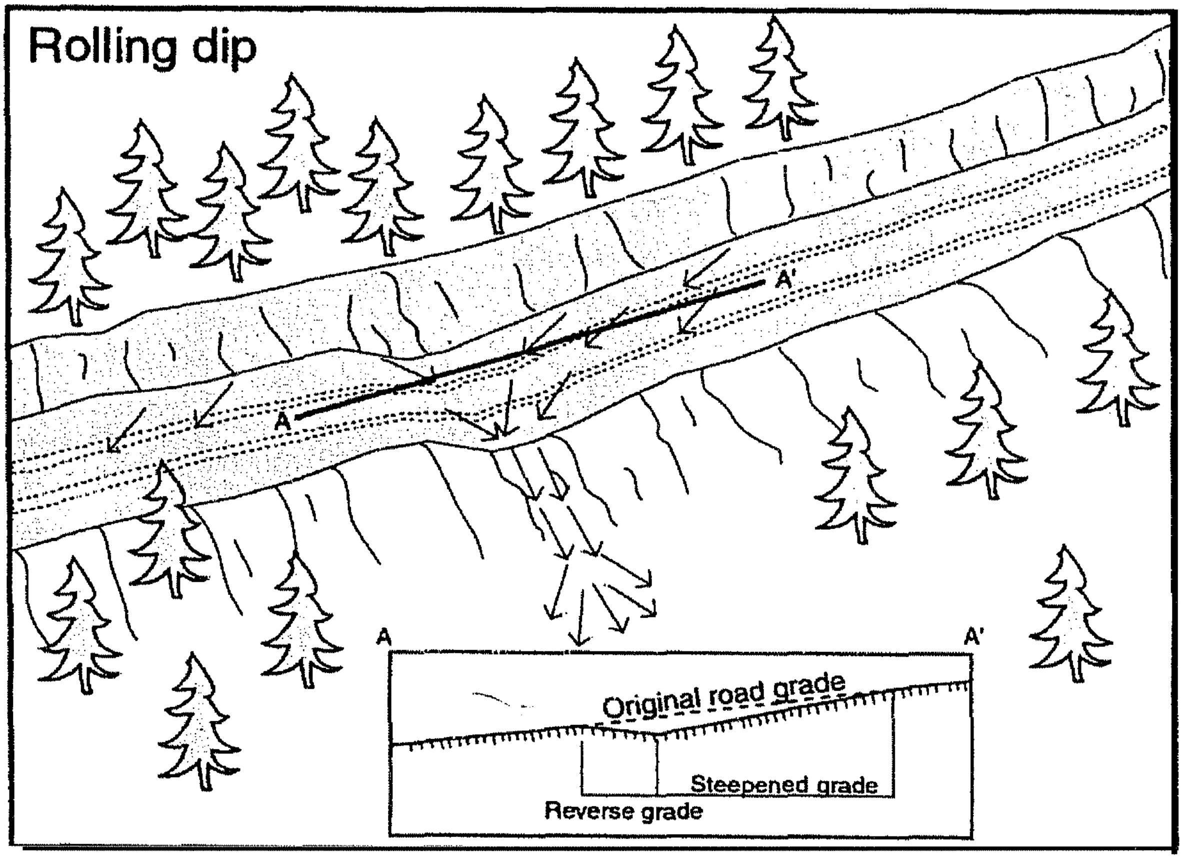
The following summarizes standard road upgrading techniques" For more detail, see *Handbook for Forest and Ranch Roads* (PWA 1994) or the corresponding video *Forest and Ranch Roads* (PWA 2003).

Rolling Dip Installation

- Install rolling dips in the roadbed as needed to drain the road surface. Rolling dips can be sloped either into the ditch or to the outside of the road edge as required to properly drain the road and disperse surface runoff.
- If the rolling dip is designed to divert both road surface and ditch runoff, block the down-road ditch with compacted fill.
- Rolling dips are usually built directly across the road alignment with a cross grade at least one percent greater than the grade of the road (so that it will drain).
- Excavate the rolling dip with a medium size bulldozer (D-7 size) with rippers or with a grader.
- Begin excavation of the dip approximately 50 to 100 feet up-road from the proposed axis of the dip (Figure X-18). Progressively excavate material from the roadbed, with the grade becoming steeper, until reaching the axis (Figure X-20)"
- Determine the depth of the dip, by the grade of the road (Figure X-18). In all cases, rolling dip dimensions must be consistent with the type of vehicles that will be using the road (Figure X-20).
- On the down-road side of the rolling dip axis, install a grade change to prevent runoff from continuing down the road. Carry the rise in grade for about 15 to 25 feet, or more, and then fall back to the original slope (Figure X-20). The axis of the dip must be a broad "u" shape to facilitate good driveability.
- In all cases, the rolling dip must be driveable and not significantly inhibit traffic and road use. It must also effectively drain the road surface.

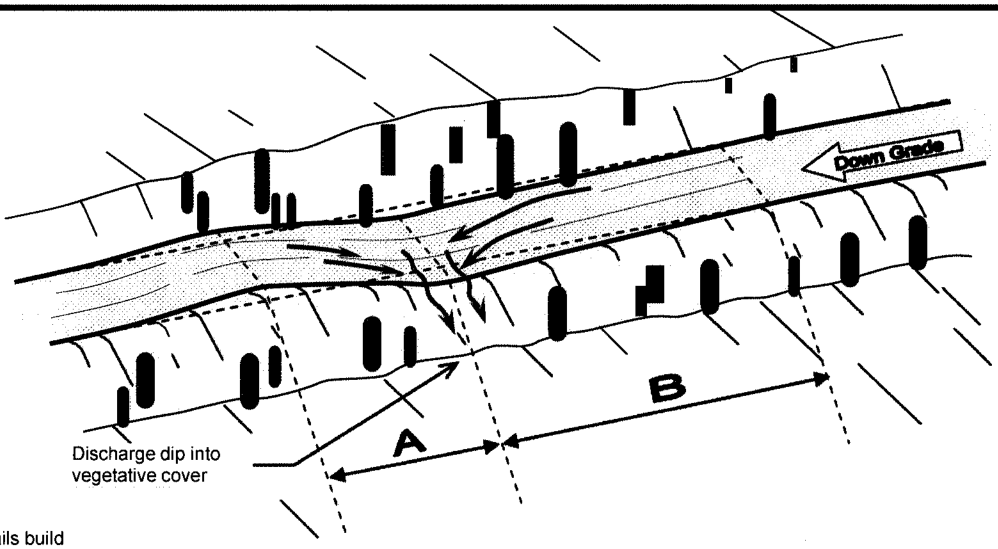
Table of Rolling Dip Dimensions				
Road grade %	Upslope approach (distance from up-road start of rolling dip to trough) (ft)	Reverse grade (distance from trough to crest)	Depth below average road grade at discharge end of trough **(ft)**	Depth below average road grade at upslope end of trough (ft)
<6	55	15-20	0.9	0.3
8	65	15-20	1.0	0.2
10	75	15-20	1.1	.01
12	85	20-25	1.2	.01
>12	100	20-25	1.3	.01

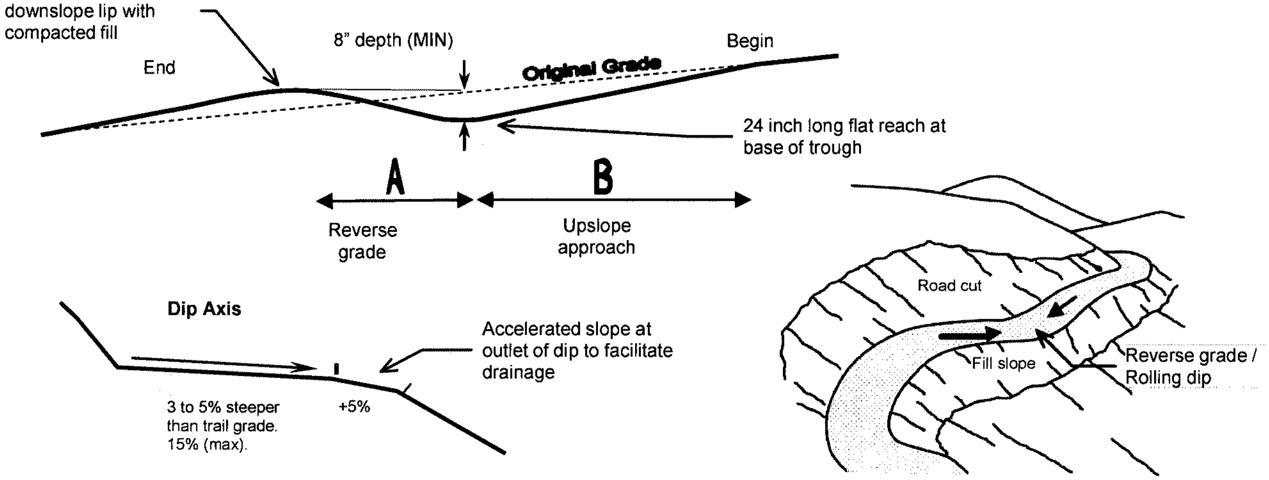
Table X-7. Table of rolling dip dimensions.



Note: Rolling dips must drain the road surface and be driveable for the expected traffic.

Figure X-20. Specifications and use of rolling dips to reduce ditch erosion and surface runoff.




On existing trails build downslope lip with compacted fill
End
8" depth (MIN)
Original Grade
Begin
24 inch long flat reach at base of trough
A
B
Reverse grade
Upslope approach
Dip Axis
Accelerated slope at outlet of dip to facilitate drainage
3 to 5% steeper than trail grade. 15% (max).
+5%
Road cut
Fill slope
Reverse grade / Rolling dip

ROAD GRADE (%)	TROUGH	A: REVERSE GRADE	B: UPSLOPE APPROACH	
	Min.depth below downslope crest	Min. distance and grade from trough axis to downroad crest (ft)	Distance from up-road start of rolling dip to trough axis (ft)	Grade (%)
<5%	8"	7 feet at 10% to 15 feet at 5%	17	10%
10%			30	15%
15%			60	20%

NOTES:

- A reverse grade dip (or rolling dip) is a broad long permanent dip constructed into native soils. It is intended to drain the trail/road while not significantly impeding traffic.
- On existing trails/roads the dip is cut into the existing tread with the down road dip built up on compacted fill.
- The dip shall be a minimum of 8 inches deep and incorporate a 2-foot long flat reach at the base of the trough (unless otherwise directed).
- The down road reverse grade of the dip shall generally sloped 5% for minimum 7 feet to 10% for minimum of 15 feet to form the minimum 8 inch deep dip. On roads/trail steeper than 15% a steeper reverse grade dip may be required
- The dip axis should be out sloped 3% greater than trail grade to maximum 15%.
- Dip outlets should be located to drain into areas with adequate sediment filter quality and non-erodible material such as rock, slash, brush, etc. Where specified, the bottom of the outfall of the dip will be surface rocked.
- Where natural slopes exceed 50%, fill shall not be pushed over the dip outlet. A backhoe or excavator may be required to pull back fill at outlet of existing dips.
- Dips shall be placed as specified in the plans. If not specified then dips shall be placed at maximum 75 foot spacings.

6A1

REVERSE GRADE DIP (Typical)

EXISTING ROAD OR TRAIL

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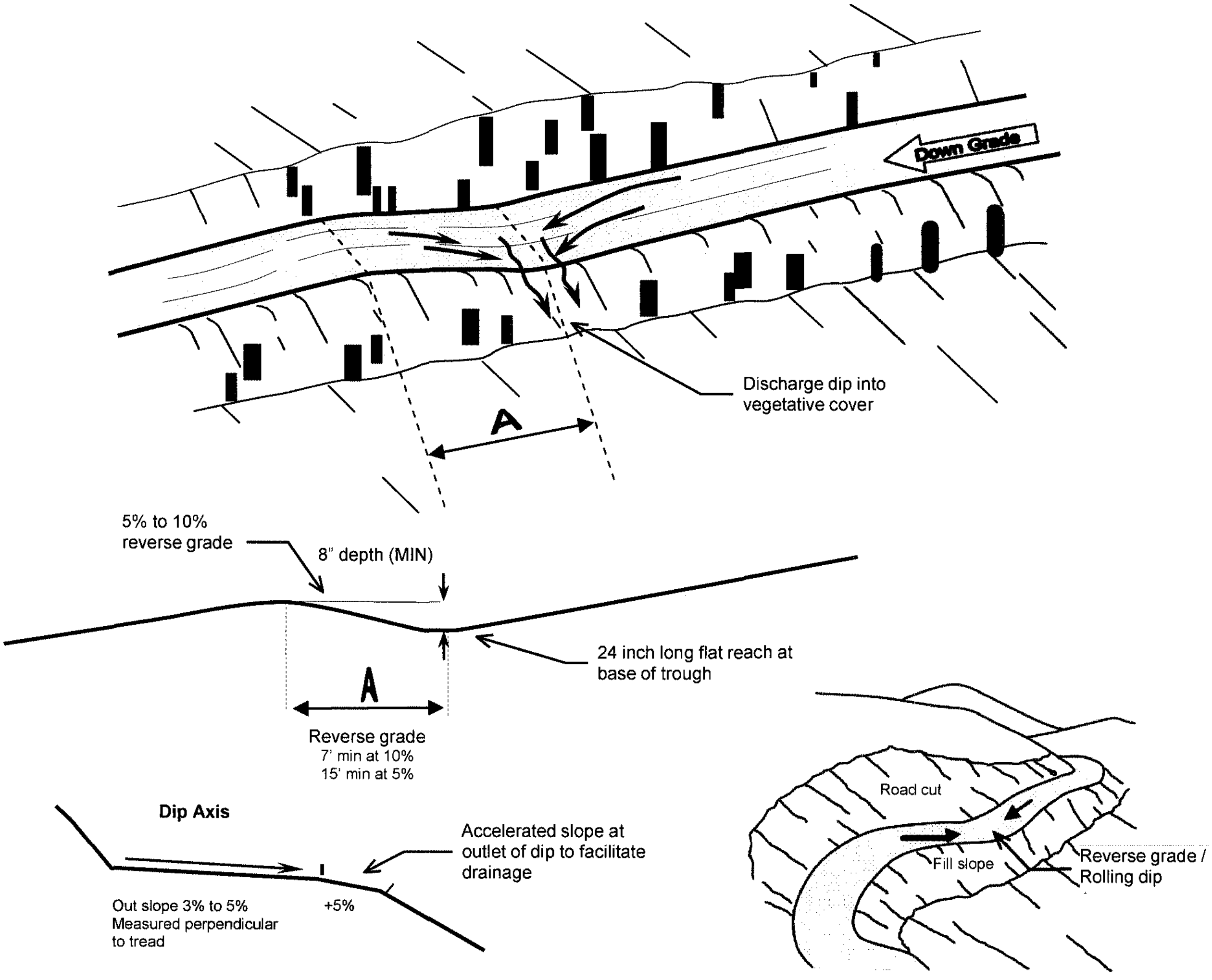
**REVERSE GRADE DIP:
EXISTING ROAD / TRAIL**

Standard Detail 6A1

Date: November 29, 2011


Down Grade
A
Discharge dip into vegetative cover
5% to 10% reverse grade
8" depth (MIN)
24 inch long flat reach at base of trough
A
Reverse grade
7' min at 10%
15' min at 5%
Dip Axis
Accelerated slope at outlet of dip to facilitate drainage
Out slope 3% to 5% Measured perpendicular to tread
+5%
Road cut
Fill slope
Reverse grade / Rolling dip

TRAIL GRADE (%)	TROUGH	A: REVERSE GRADE	
	Min. Depth below downslope crest	Min. distance from trough axis to down trail crest (ft)	Grade (%)
0-5%	8"	15	-5%
0-15%	8"	7	-10%
>15%	As directed		

NOTES:

- A reverse grade dip (or rolling dip) is a broad long permanent dip constructed into native soils. The dip is long to prevent breaking down over time. On new trails the dip is incorporated into the trail at the time of construction.
- The dip shall be a minimum of 8 inches deep and incorporate a 2-foot long flat reach at the base of the trough (unless otherwise directed).
- The reverse grade shall be sloped 5% for minimum 15 feet to 10% for minimum of 7 feet to form the minimum 8 inch deep dip.
- The dip axis should be out sloped (measured perpendicular to trail) 3% to 5% unless otherwise specified or directed.
- Dip outlets should be located to drain into areas with adequate sediment filter quality and non-erodible material such as rock, slash, brush, etc. Where specified, the bottom of the outfall of the dip will be surface rocked.
- Where natural slopes exceed 50%, fill shall not be pushed over the dip outlet. A backhoe or excavator may be required to pull back fill at outlet of existing dips.
- Dips shall be placed as directed or specified in the plans. If not specified then dips shall be placed at maximum 75 foot spacings.

6A2

REVERSE GRADE DIP (Typical)

NEW TRAIL CONSTRUCTION

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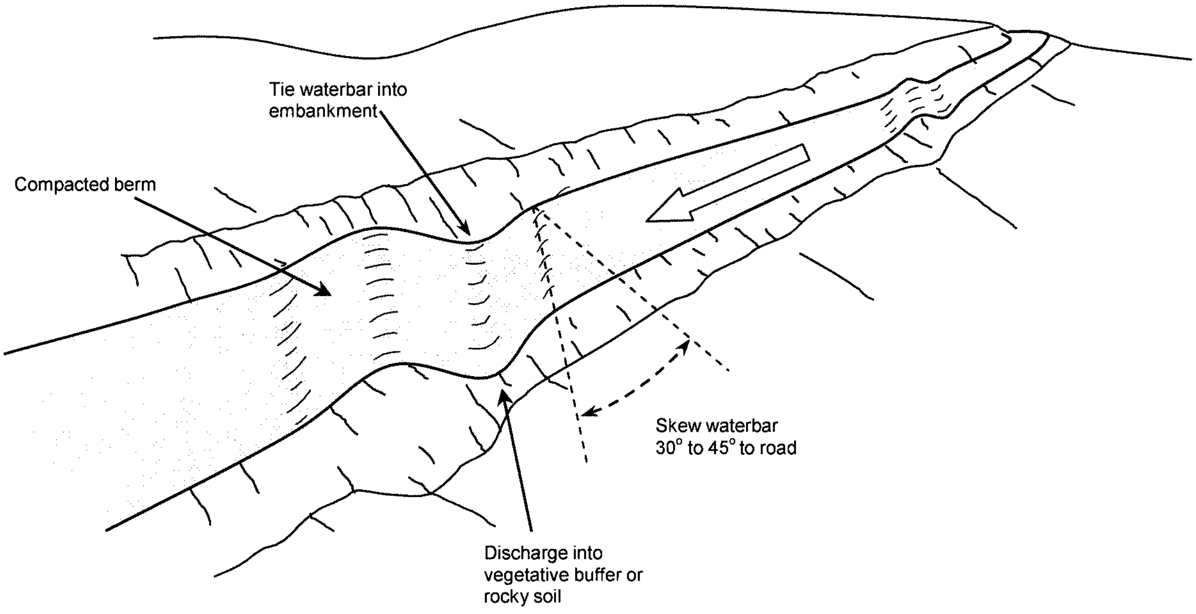
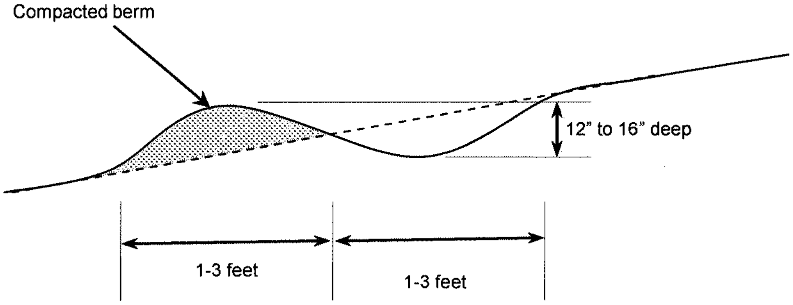
(831) 425-5832 (831) 425 5830 fax.

REVERSE GRADE DIP: NEW TRAIL CONSTRUCTION

Standard Detail 6A2

Date: November 29, 2011


Tie waterbar into embankment
Compacted berm
Skew waterbar 30° to 45° to road
Discharge into vegetative buffer or rocky soil



NOTES

- Identify waterbar locations that take advantage of natural drainage features and minimize the amount of disturbance required for waterbar construction
- All waterbars shall begin at the intersection of the roadbed surface and the cut slope and run the entire width of the road surface prism.
- Waterbar length shall not exceed 1.5 times the width of the road surface.
- Acceptable waterbars shall be skewed 30 to 45 degrees.
- All waterbars shall have free flowing outlets with minimum 2% grade in the bottom of the channel that discharge onto vegetative surfaces or less erodible material where possible.
- Native materials used to construct downslope berm shall be compacted with equipment to minimize wear resulting from trespass and/or administrative use.
- Waterbar depth measured from the bottom of the waterbar channel to the top of the compacted berm must be between 12" and 16" high.
- Compacted waterbars must be passable in a 4WD vehicle unless otherwise specified in the contract.

6C **WATERBAR (Typical)**
NTS

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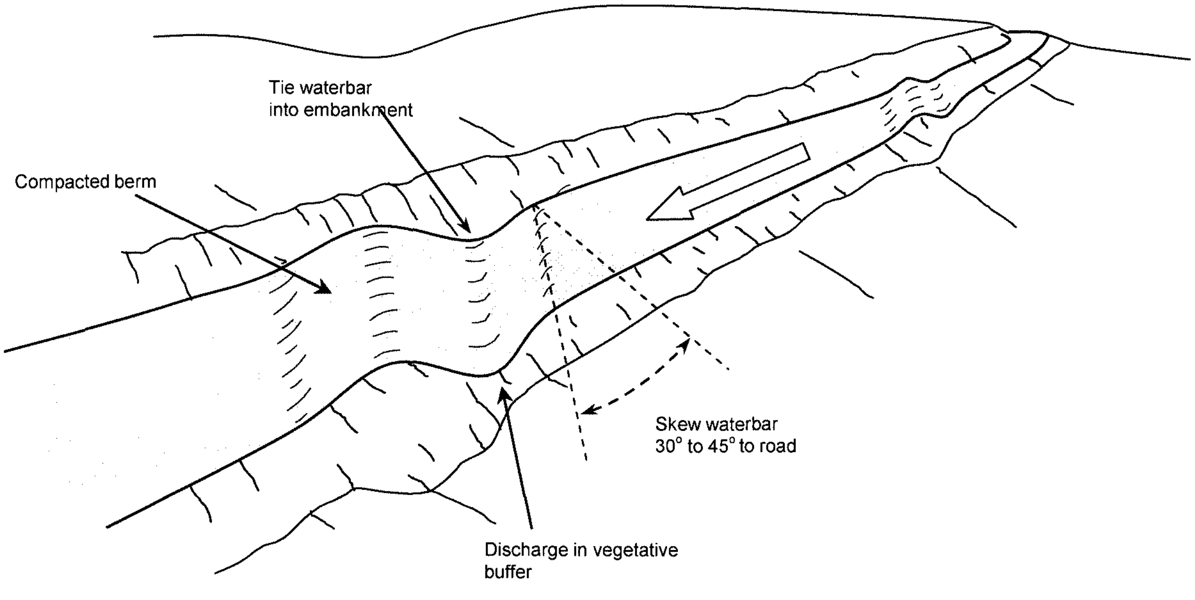
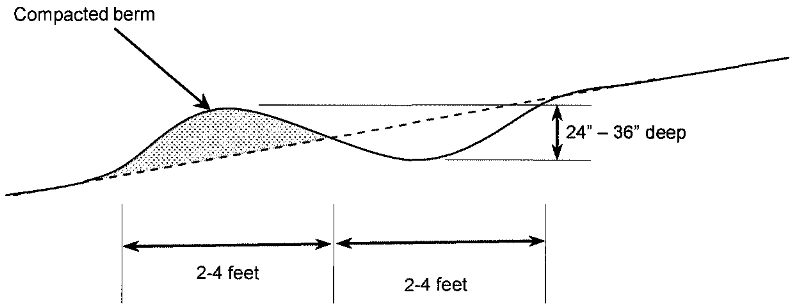

Tie waterbar into embankment
Compacted berm
Skew waterbar 30° to 45° to road
Discharge in vegetative buffer



NOTES

- Large waterbars are to be used on roads proposed for abandonment to correct drainage and prevent vehicle access
- Identify waterbar locations that take advantage of natural drainage features and minimize the amount of disturbance required for waterbar construction
- Acceptable waterbars shall be skewed 30 to 45 degrees.
- All waterbars shall have free flowing outlets with minimum 2% grade in the bottom of the channel that discharge onto vegetative surfaces or less erodible material where possible. Pull back perched fill at dip outlet
- Native materials used to construct downslope berm shall be compacted with equipment to minimize wear resulting from trespass.
- Waterbar depth measured from the bottom of the waterbar channel to the top of the compacted berm must be between 24" and 36" high.

9E **LARGE WATERBAR (Typical)**
NTS

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LARGE WATERBAR
TYPICAL SPECIFICATIONS

Standard Detail 9E

Date: March 22, 2012

Brushlayering with Soil Wrap

This technique consists of live cut branches (brushlayers) interspersed between layers of soil wrapped in natural or synthetic geotextile materials. The brush is placed in a crisscross or overlapping pattern so that the tips of the branches protrude just beyond the face of the fill, where they act as horizontal drains and improve slope stability by redirecting the flow direction. Natural geofabrics, such as coir netting, are typically wrapped around the soil layer to provide additional soil surface protection and reinforcement.

Conditions Where Practice Applies

Brushlayering with geotextile soil wraps can be used to stabilize very steep slopes. They provide an alternative to vertical retaining structures for grade separation purposes and in situations that require avoiding right-of-way encroachment at the base or top of slopes. Geotextile soil wraps can also be used to protect slopes that are subject to periodic scour or tractive stresses, such as drainage channels or upper portions of streambanks.

Materials

Long branches of trees and brush which are capable of vegetative propagation, usually willows. The length of the branches will vary with the type of application (embankment or buttress fill) and desired depth of reinforcement; ideally they should be long enough to reach the back of a buttress fill. The inert construction material consists of natural geofabrics such as coir netting, or synthetic, polymeric geogrids. Natural geofabrics or geogrids are then wrapped around the soil layers to protect the slope face and provide a stable planting surface.

Implementation

Begin at the base of the slope and proceed upward. See typical drawing below for the step by step procedures of brushlayering with soil wrap. The vegetated soil wrap structure should be supported on a rock toe or base and be battered or inclined at an angle of at least 10 to 20 degrees to minimize lateral earth forces. A trench should be excavated to a competent horizon as well as below the likely depth of scour.

The fabric is installed by placing it on top of the soil so that at least 0.5 m (3 feet) can be anchored by wooden stakes to the soil-gravel layer. Allow 2 m (6 feet) of fabric to extend beyond the brushlayer so that it will lap over and cover the soil-gravel mix , then stake into place. Crisscross layers of dormant cuttings and/or transplants on top of the soil wrap, placing the cut ends into the slope with the tips extending beyond the edge of the bench (no more than ¼ of the total branch length). Care should be taken to place the branches at random with regard to size and age and species composition. Deposit a layer of topsoil over the cuttings and tamp into place.

Brushlayering with Soil Wrap (continued)

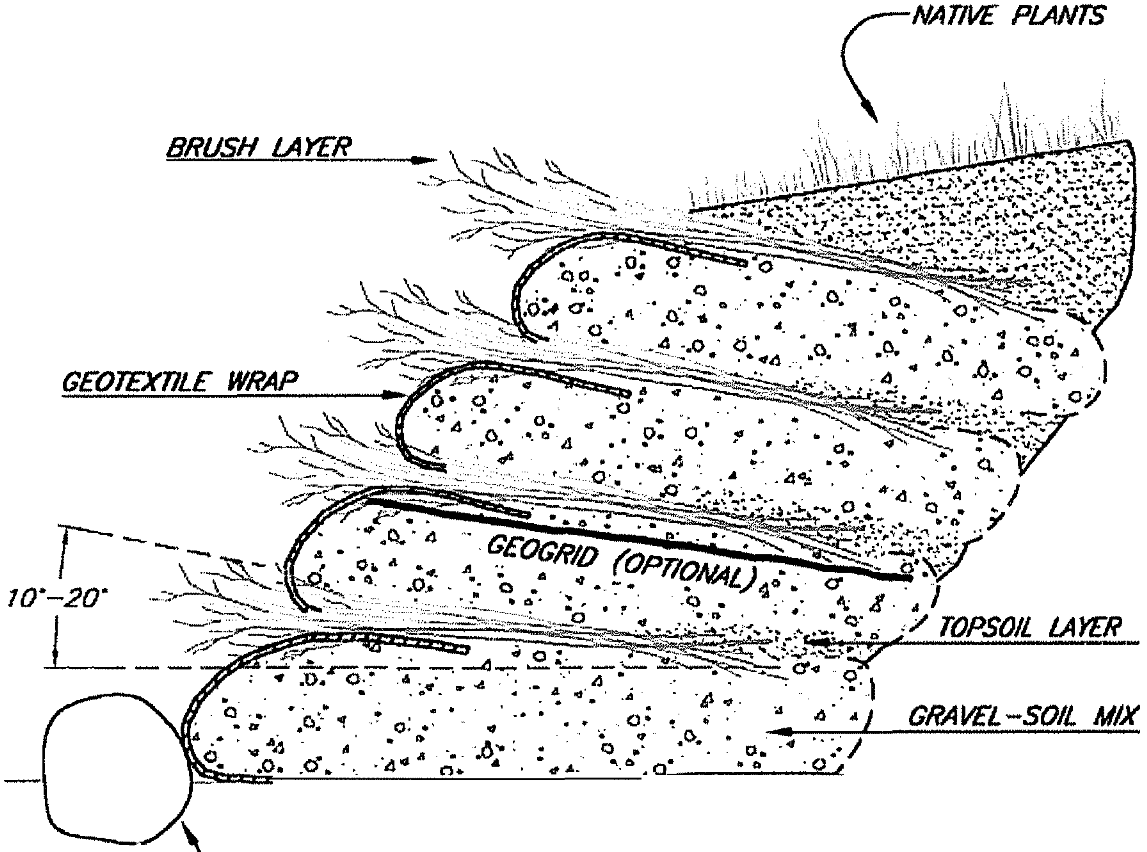
Repeat the branch, topsoil, and wrapped soil-gravel mix layering sequence until the desired bank height is achieved. Fill slopes can be created at the same time a brushlayer is installed. On a cut slope and existing streambanks, each layer is excavated at the time the brush layer is installed.

BRUSHLAYERING

Construction Specifications:

- Cuttings shall be harvested and planted when the willows, or other chosen species, are dormant. This period is generally from late fall to early spring.
- Choose plant materials that are adapted to the site conditions from species that root easily
- Branch cuttings shall be 4-8 feet (1 2-2.5 m) long, 3/4-2 inches (20-50 mm) in diameter.
- Pre-soak cuttings for a minimum of 24 hours before installing.
- The surface of the bench shall be sloped so the outside edge is higher that the inside so the butt ends angle down slightly into the slope.
- Place branch cuttings, 3-8 inches (76-203 mm) thick, in a crisscross or over lapping configuration. The growing tips shall protrude 6-12 inches (152-305 mm) from the slope face with the butt end dipping into the slope.
- Immediately cover brushlayer with 6 inches (152 mm) of fill soil and compact according to construction specifications. Water the soil cover immediately to wet the cuttings and achieve adequate compaction.
- Earth moving equipment shall not travel directly over the cuttings Six inches (152 mm) of soil must be maintained between the brushlayer and equipment at all times
- Fill and compact the soil placed above the brushlayer in successive lifts, maximum 6-8 inches (152-203 mm) deep.
- Install the next brushlayer 3-8 feet (1-2.5 m) above the previous row.
- Seed and mulch slope. Shallow slopes, generally 3:1 or flatter may be seeded and mulched by hand. Steeper slopes should have seed applied hydraulically and the mulch shall be anchored with tackifier or other approved methods.

Inspection and Maintenance: Regular inspection and maintenance of bioengineering installations should be conducted, particularly during the first year. Prompt correction of any failures is essential to prevent major problems from developing.



Alternative design treatments far toe of slope include, geobags, n"prap, roo/wads, logs, etc..

NOTES:
1. Brush layers, geofabrlcs and geogn'ds are tensile inclusions, wh1'ch modify shear stress.
2. Additionally. once established the root systems bind the entire system together as a coherent mass.
J. Live brush layers act as hon'zantal drains and improve slope stability by redirecting the flow direction.
4. Cut branches J' to 12' long from appropriate salix, comus or populus species.
5. Branches up to 12' long con be used on fl'llslope installations. Branches for cuts/ope inslol!otion con be 2' to 10' long depending on the bench excavation.
6. Natural geofobn'cs (coir netting) or geogn'ds con be wrapped around soil foyers to provide additional s01'l reinforcement.

BRUSHLAYERING WITH
GEOTEXTILE SOIL WRAP

1999 JOHN McCULLAH

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Brushlayering with Rock Toe Protection

Brushlayers with rock toe are rows of live woody cuttings that are layered, alternating with successive lifts of soil fill, to construct a reinforced slope or embankment above a rock toe that armors the bank until the vegetation becomes established.

Conditions Where Practice Applies

Streambanks with low velocities, and slopes up to 2:1 that are susceptible to shallow mass movement. Sea or lake shores with light to moderate wave energy.

Materials

Live willow branches (or cuttings of other adventitiously-rooting species) at least 6 ft long, with a minimum diameter of ¾ in. Rock sized appropriately to resist velocities at design discharge.

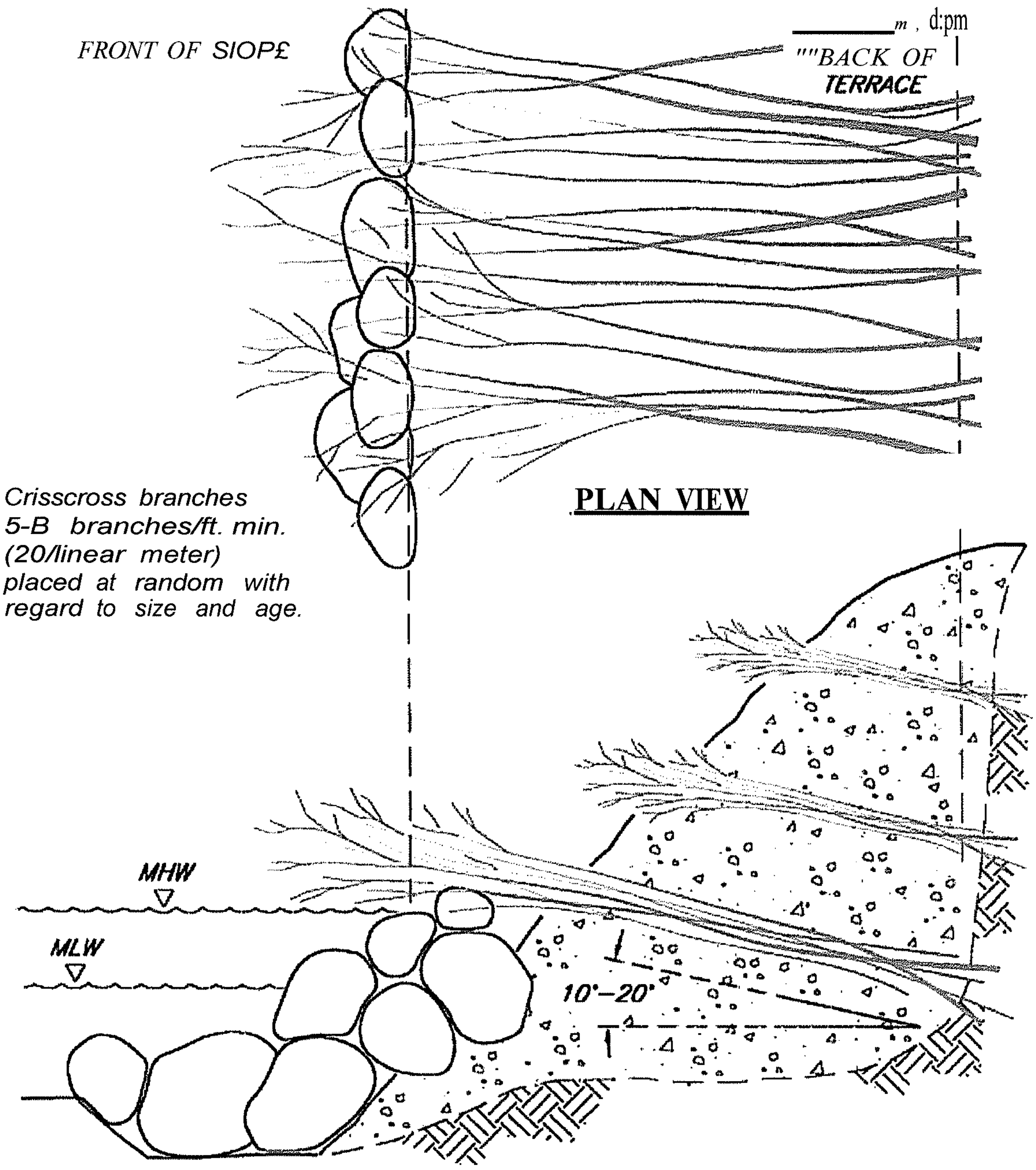
Advantages

Brushlayering involves relatively simple construction. Among the ground stabilizing techniques, the brushlayer has an immediate impact, its protective and stabilizing effect extending into lower soil horizons. At extreme sites where erosion, deposition, and rockfall are particular hazards, brush layers and the pioneer vegetation that develops with them gradually eliminate these problems. Fast establishment of a stable soil-root complex is possible. Relatively short and spreading branches of the scrub willows growing in mountainous regions can be used. Simultaneous brushlayering construction during fill operations is possible. It is one of the best techniques for revegetating and stabilizing streambanks and slopes. Living and non-living brush layers along streambanks also provide valuable fish habitat.

Brushlayers also provide a flexible strengthening system to fills. A bank can sag or distort without pulling apart the brushlayers. The brushlayers will "stretch" because they are laid in to the slope on a diagonal, and are also self-repairing to the extent that they regrow roots in the case of a shear failure. Brushlayers act as horizontal drains and favorably modify the soil water flow regime.

Implementation

Place rock as designed. The rock should extend up the bank to the expected mean high water. Construct by excavating or filling a terrace above the rock protection. The terrace must slope back into the slope 10-20 degrees minimum. Place branches at least 6 ft long on the terrace. Branches shall crisscross at random with regard to size and age. Place 5-8 branches per linear foot (20/linear m), and 8-18" should protrude beyond the face of the slope. Cover and compact (add water if necessary) the brush layer with 6-18" of soil and construct another terrace and brushlayer. Proceed up the bank as desired.



Crisscross branches
5-B branches/ft. min.
(20/linear meter)
placed at random with
regard to size and age.

NOTES:

1. Till branches down into the slope 10'-20' min.
2. Brushlayer/ng may be constructed with non-compacted or compacted back(! / without damage to the brush layer.
3. Branches irrespective of length, should protrude 8-18in. (0.20-0.50 meters) beyond the face of the slope.

BRUSHLAYERING WITH ROCK TOE PROTECTION

1999 JOHN McCULLAH

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Brush Mattress (Brush Mat)

A brush mattress or brush mat is a revegetation technique that provides a protective covering to a slope or streambank as soon as it is installed. A brush mattress is typically constructed using live willow branches or other species that root easily from cuttings, but can also be constructed with any brushy, woody branches in order to provide immediate and effective slope protection.

Conditions Where Practice Applies

Brush mattresses are ideal for eroding streambanks or slopes where immediate protection is needed. Streambanks which are in jeopardy of being scoured due to high erosive forces can be rapidly stabilized by installation of a brush mattress along the eroding reach. Because of the dense layer of brush, the brush mattress can deflect water from the bank and protect it from scouring, while also providing habitat directly along the waters' edge. Brush mattresses also work well for shoreline protection. The density of the mat will break the impact of waves and instantly provide a thick protective layer of brush along the shoreline. If the desire is to stabilize and revegetate an eroding streambank or shoreline and discourage foot trails along sensitive areas, brush mats work well as impenetrable barriers, giving time for vegetation to become established. On slopes, brush mattressing provides rapid protection against surficial erosion. Brush mats are often combined with other soil stabilization techniques such as vegetated riprap, wattles, live Fascines, root wads, live siltation, or coir logs, which may be needed to secure the toe of the slope. The brush mattress technique is usually most effective on slopes no steeper than 2H:1V.

Advantages

Brush mattresses quickly stabilize a slope or streambank by providing a dense network of branches which prevent surficial erosion, while also collecting soil and native seeds. The overlapping branches provide an ideal environment for native seeds to germinate and establish. As the live branches root and grow, the soil is reinforced with an underground matrix of spreading roots. If used on streambanks, a brush mat will trap sediments during high water, and eventually the plant growth on the stabilized streambank will provide aquatic habitat. Brush mattresses work well for stabilizing reconstructed stream channels, as they provide immediate cover for fish and instant bank protection, even before they become established and grow.

Of all the streambank biotechnical practices, brush mattresses can withstand the highest velocities. Studies conducted by Christoph Gerstgraser, Universitat fur Bodenkultur, Vienna, Austria, demonstrated that brush mattresses stabilized the bank in a test flume against velocities exceeding 7 m/s (20 f/s), while other techniques, even rock riprap, failed.

Brush Mattress (Brush Mat) (continued)

Disadvantages

Large numbers of cuttings are required, probably more than any other biotechnical method, and the availability of plant material should be carefully evaluated before including this technique in a revegetation design. Brush mat installation is a labor-intensive construction method. As with most biotechnical projects, if using live cuttings, brush mattresses must be installed during the dormancy period of species used. In areas which receive little rainfall, brush mattresses installed on dry slopes may not survive long, as this technique does not entrench the branches deeply into the soil.

Implementation

- Prepare the slope or streambank by clearing away large debris, and the slope should be graded so that branches will lay flat on the bank. Do not disturb the slope or bank any more than necessary. Excavate a horizontal trench, 8 to 12 inches deep, at the toe of the streambank or at the base of applicable area on the slope. The basal ends of the branches should extend into moist soil.

- Lay the cuttings flat against the graded slope, slightly crisscrossed, with the basal ends placed as deeply into the trench as possible. Continue to lay the cuttings along the face of the bank or slope until about 80% groundcover is achieved (about 6-12 inches thick). If the length of the slope or bank is longer than the cuttings, stagger and overlap the cuttings so the entire area has adequate coverage. Rooted plants can be planted within the brush mattress, but these should be planted before the branches are laid, as it is too difficult to plant through the mattress afterward.

- Pound in a grid of 24 to 36 inch long stakes into the mattress at 3 to 4 foot centers. Do not pound the stakes completely in, as this will be done after tying. Use longer stakes in less cohesive (sandy) soil. Secure the brush mattress by using cord, rope, or 10-12 gauge galvanized wire tied in a diamond pattern between each row of stakes. (Tie the cord or wire to the stakes in such a manner that if it breaks, the integrity of the remaining cord or wire is still maintained). Notching or drilling stakes may make securing cord or wire to stakes easier, but is not necessary.

- After networking the mattress with cord or wire, drive the stakes in further to compress the mattress tightly against the slope. If constructing a brush mattress on a streambank, be careful not to leave loose overhanging branches which may catch on material floating down the stream channel. The mattress may be ripped from the streambank if this occurs.

Brush Mattress (Brush Mat) (continued)

- Secure the toe of the mattress using the technique best suitable for the site conditions. To secure the toe of the mattress using a willow wattle, first construct a wattle the length of the area to be treated (see wattle technique). Make sure the wattle is tied together tightly. Place the wattle in the trench over the cut ends of the brush mattress. Secure the wattle with 18 to 48 inch long wedge-shaped wooden stakes every 3-4 feet. In some cases, such as small streams or gentle slopes, simply placing large locally collected rocks around and on top of the basal ends of the cuttings is enough to secure the toe of the mattress. Other techniques which may be used include vegetated riprap, wattles, live fascines, rootwad revetments, live siltation, or coir logs.

- Backfill around and in between the branches of the mattress by using material excavated from the trench, working the soil in well. Buckets of water will help to wash the soil down into the stems. It is most important for the thicker, basal ends of the mattress to get good soil cover for rooting, but generally cover at least 1/4 of the depth of the mattress with soil. If installed along a stream, make sure the upstream end of the mattress and wattle is keyed into the streambank to prevent high flows from scouring behind the mattress. It is also a good idea to protect this area with some revetment, large rocks, or tree trunks. If possible, tie the mattress to existing vegetation or roots on the bank for extra security.

Maintenance

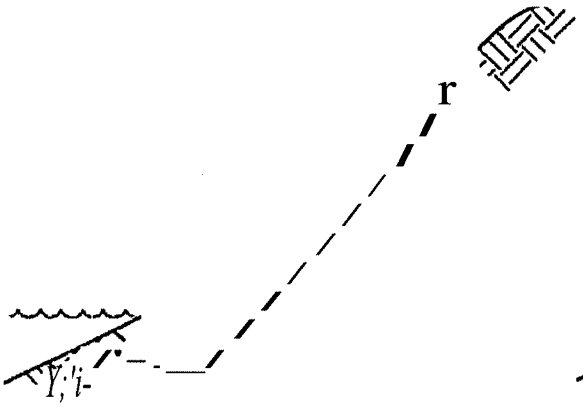
It is important to monitor the brush mattress after it has been installed. Periodic monitoring of the project will provide valuable insight into the stabilization process and may offer important information for future biotechnical projects. If the willow does not grow, the mattress will still provide stability, especially if it is backfilled and seeded with native grasses, sedges, or rushes.

Periodic maintenance includes making sure the stakes and cord/wire are still securing the mattress to the streambank. The upstream end should be carefully checked to make sure flows are not getting behind the mattress. To ensure the highest success for the treated area, determine the land management practices that created the eroded streambanks and modify those practices as necessary (From Bentrup and Hoag, 1998).

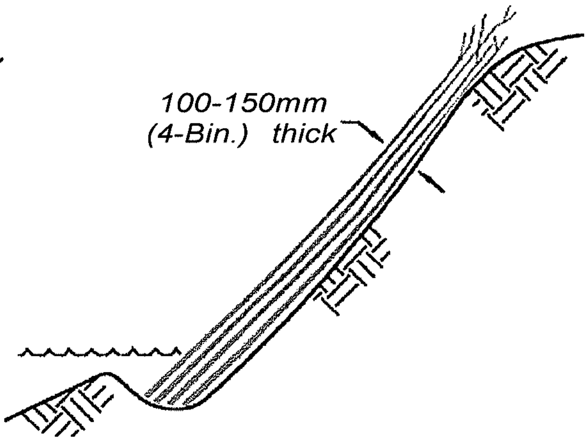
If the area is grazed, restrict livestock from treated area to allow the eroded section of the streambank to heal. Exclosure fences are the most efficient means to accomplish this goal. Managers should resist the temptation to put the exclosure fences at the high water line. The exclosure area should include enough of the riparian zone to allow the stream to shift naturally over time.

If the area is farmed, a riparian buffer strip should be established and maintained. A buffer strip on both sides of the stream should be set aside to allow for natural riparian vegetation and stream function. A wider buffer strip is strongly encouraged and will yield greater benefits.

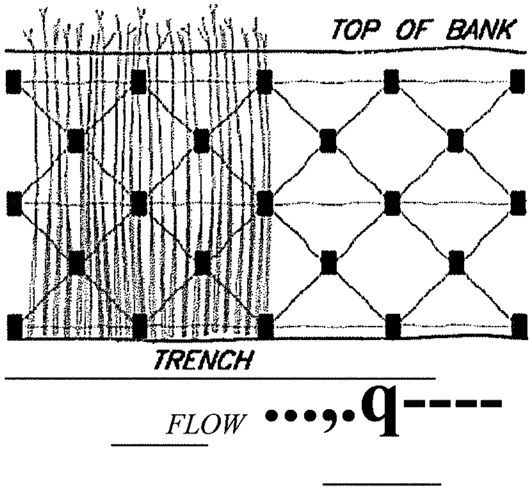
Finally, a stream is an interconnected system. Land use practices both upstream and downstream will affect the success of your bioengineering work.



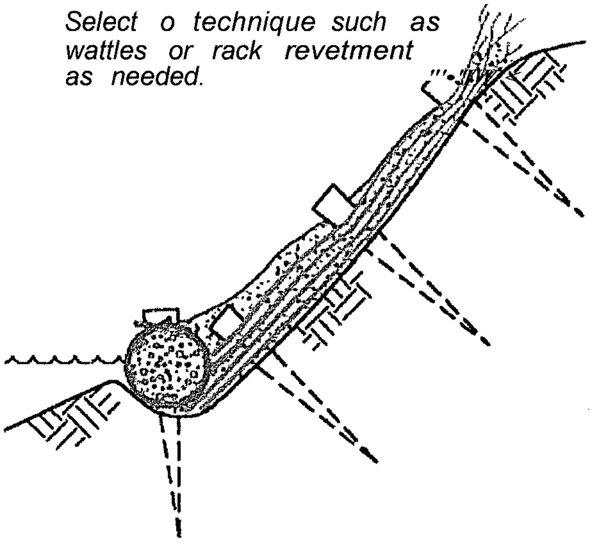
Step 1: Excavate trench and grade bank.



Step 2: Place willow branches making sure that the **bull** ends reach the bottom.



Step 3: Place stake (notched) on !.Om ***(3ft)*** centers and secure the mallress with twine, rope or wire.



Select o technique such as wattles or rack revetment as needed.

Step 4: Dn've the stakes deeply into the bank to tightly compress the branches against the soil. Cover and partially bury /he mallress to encourage rooting.

BRUSH MATTRESS

2000 JOHN McCULLAH

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Coir Rolls with Brushlayering

Coir logs (also called coir rolls or fiberschines) are long cylindrical tubes that are composed of interwoven coconut fibers which are bound together with durable coir netting. Coir rolls are particularly applicable for wetland, streambank, and shoreline projects. Coir rolls are most commonly available in 12 inch diameters and 20 foot lengths. These rolls can be linked together to form longer tubes, and are often used in combination with other biotechnical techniques, such as brushlayering or live siltation. Coir logs encourage siltation and wetland/floodplain creation.

Conditions Where Practice Applies

The tough, long-lasting coconut fibers make coir rolls appropriate for wetland, streambank, and shoreline applications. Coir rolls work well when immediate erosion control is needed. Brushlayers work well with coir roll applications, adding further stabilization with a live root system, while also providing excellent habitat features. The coir roll provides a base for the brushlayer cuttings to be laid upon at an appropriate angle which benefits the growth of cuttings. The cuttings provide further protection from breaking waves and high flows.

Materials

Coir rolls of the appropriate size and length, live cuttings for brushlayering, and strong rope and wooden stakes are necessary. Also needed is machinery and/or tools for leveling and compacting soil. If using a soil wrap, material (blanket or mats) appropriate to the application conditions is needed. If planning to plant coir rolls with container plants, suitable plant material such as wetland grasses are needed.

Advantages

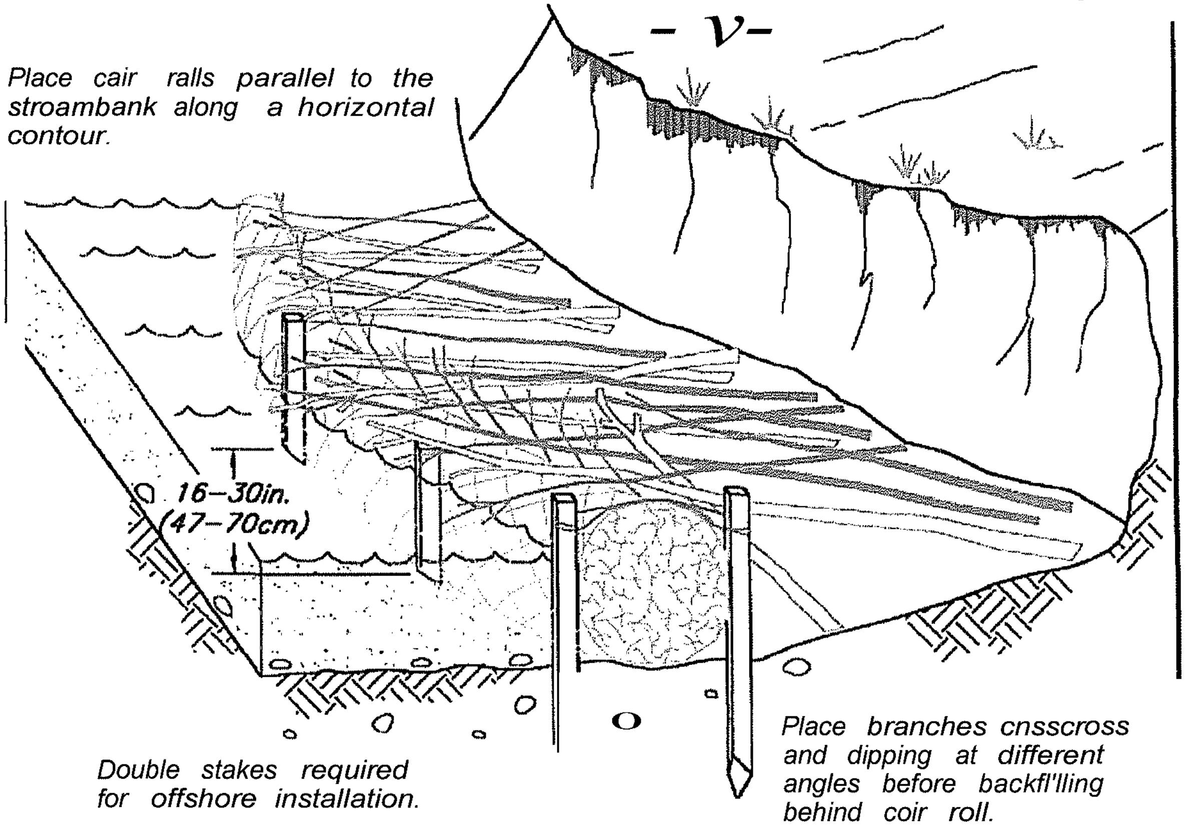
Provides a "soft" engineering method for shoreline and streambank stabilization as opposed to "hard" engineering such as gabions and riprap alone. This makes coir rolls with brushlayering more appropriate for recreational use areas where swimmers could be injured by wire or rocks, or critical fisheries where habitat-friendly streambank stabilization is needed. The coir roll/brushlayering combination provides immediate shoreline and streambank protection, with additional benefits of riparian enhancement when the cuttings become established.

Implementation

Clear debris away and level area of application. Install coir rolls as specified (see fiberschines/coir rolls for implementation information). Prepare soil bed behind installed coir rolls for laying brushlayer cuttings. Determine soil level by laying a straight cutting on the coir roll with approximately 20% of the cutting sticking out past the roll, and with the basal ends dipping down into the soil. It is important that the bud ends of the live cuttings angle up to some degree from the basal ends. Lay cuttings in this fashion, slightly crisscrossed for additional strength. (See Brushlayering).

Next, backfill over cuttings with soil, covering the lower 80% of the branches. At this time, soil can be leveled and prepared for a soil wrap for additional height and soil stability. If simply covering the cuttings with soil, compact slightly and grade slope to appropriate angle. Use water to wash soil in between branch layers. Mulch and seed exposed areas with native species.

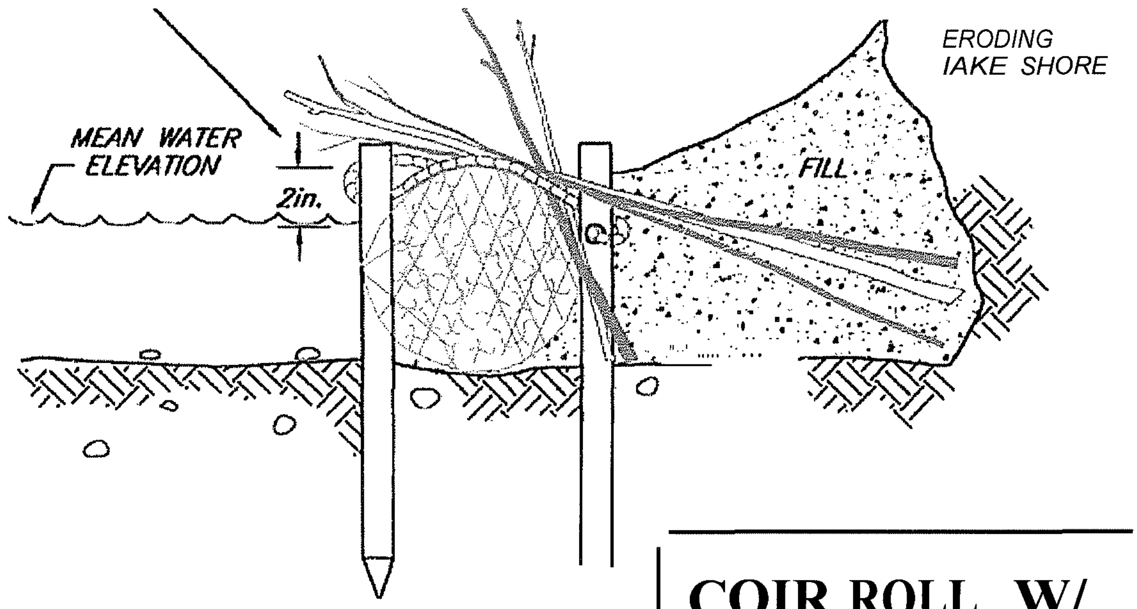
Place cair ralls parallel to the stroambank along a horizontal contour.



Double stakes required for offshore installation.

Place branches cnsscross and dipping at different angles before backfl'lling behind coir roll.

Place coir roll such that the roll extends 2in. (50mm) above mean water elevation.



JOHN McCULLAH

COIR ROLL W/ BRUSHLAYERING

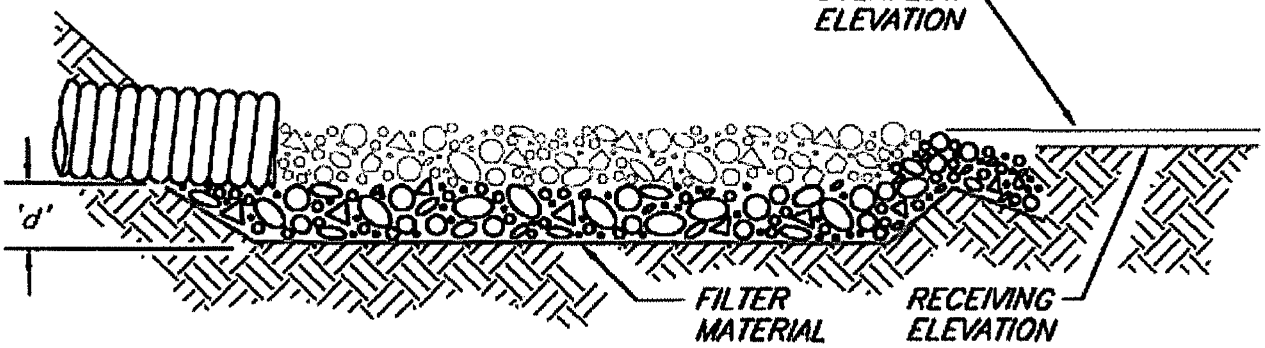
_L L8 · c rn o L

ENERGY DISSIPATOR

Construction Specifications:

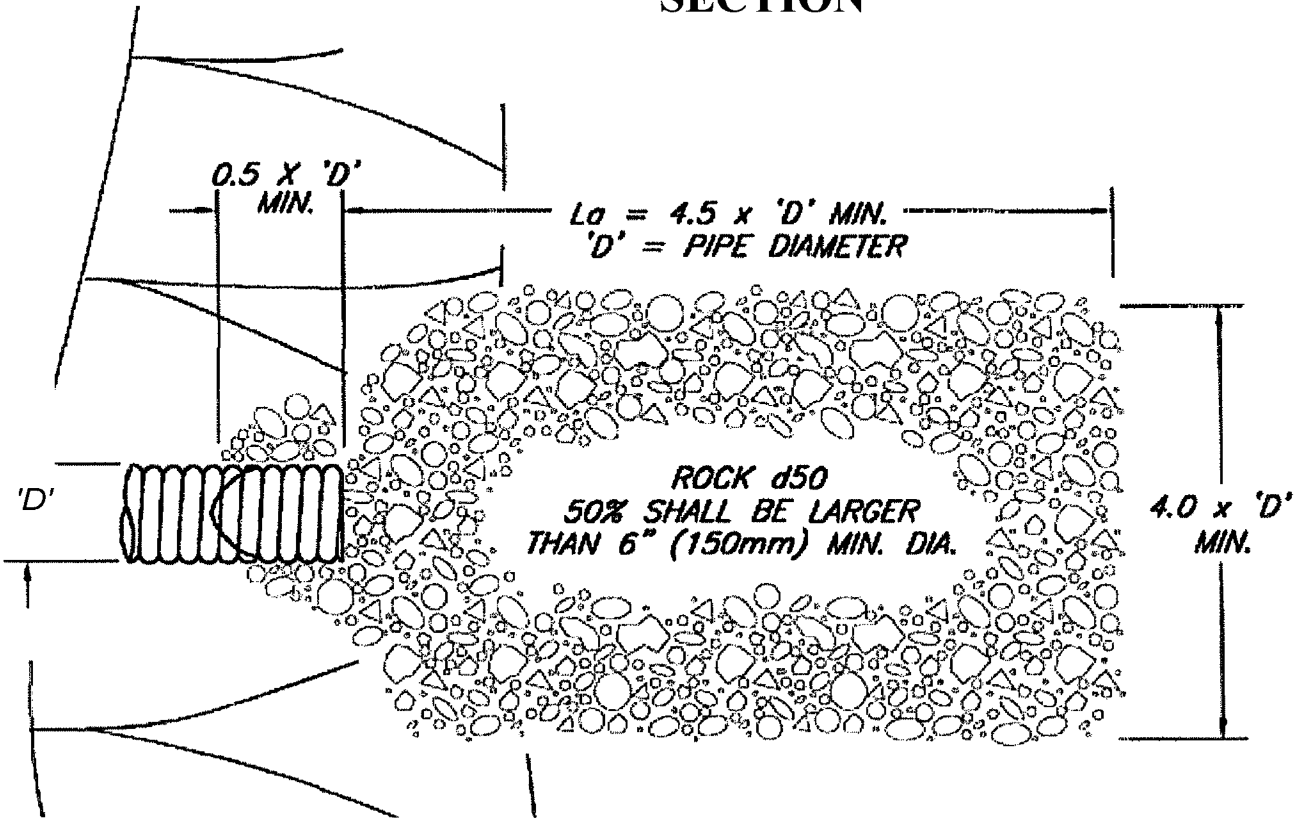
- Ensure that the subgrade for the filter and riprap follows the required lines and grades shown in the plan, Compact any fill required in the subgrade to the density of the surrounding undisturbed material Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness,
- The riprap and gravel filter must conform to the specified grading limits shown on the plans
- Filter cloth, when used, must meet design requirements and be properly protected from punching or tearing during installation, Repair any damaged fabric by removing the riprap and placing another piece of filter cloth over the damaged area, All connecting joints should overlap a minimum of I foot (03 m), Ifthe damage is extensive, replace the entire filter cloth
- Riprap may be placed by equipment, but take care to avoid damaging the filter
- The minimum thickness of the riprap should be L5 times the maximum stone diameter
- Riprap may be field stone or rough quarry stone, It should be hard, angular, highly weather-resistant and well graded,
- Construct the apron on zero l,'Tade with no overfall at the end, Make the top ofthe riprap at the downstream end level with the receiving area or slightly below it
- Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length, If a curve is needed to fit site conditions, place it in the upper section of the apron,
- Immediately after construction, stabilize all disturbed areas with vegetation,

Inspection and Maintenance: Inspect riprap outlet structures after heavy rains to see if any erosion around or below the riprap has taken place or if stones have been dislodged, Immediately make all needed repairs to prevent further damage,



THICKNESS ('d'} – 1.5 x M4.K. ROCK DIAMETER – 6" (150mm) MIN.

SECTION



PLAN

NOTES:

1. 'La' = LENGTH OF APRON. DISTANCE.' 'La' SHALL BE OF SUFFICIENT LENGTH TO DISSIPATE ENERGY.
2. APRON SHALL BE SET AT A ZERO GRAD£ AND ALIGNED STRAIGHT.
3. ALTER MATERIAL SHALL BE ALTER FABRIC OR 6• (150mm) THICK MINIMUM GRADED GRAVEL LAYER.

ENERGY DISSIPATOR

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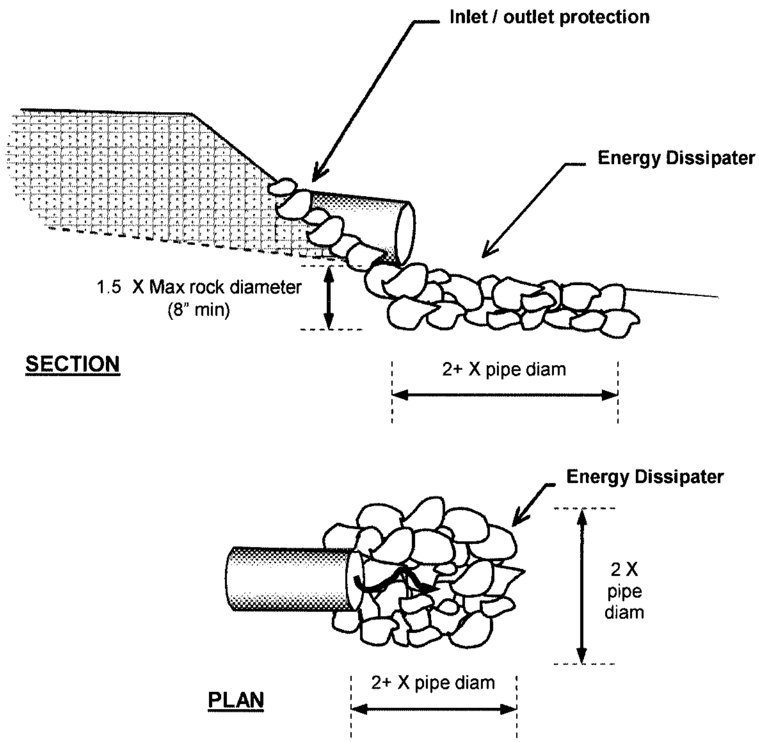
FILE: ENRGYDIS



NOTES

- **Inlet/outlet protection**
  - Armor inlet and outlet to top of culvert with rock rip rap
  - Riprap shall consist of approved well graded sound durable angular rock unless otherwise specified
  - 50% of rock (D_{50}) shall be larger than 8 inches minimum diameter unless otherwise specified
  - Rock shall be keyed minimum 1.5 times diameter into bed and banks unless otherwise specified

- **Energy dissipater**
  - Culvert shall discharge onto rock energy dissipater / apron aligned with native channel as shown on plans or directed
  - Unless otherwise specified in plans or directed by geotechnical consultant, armor shall consist of approved sound durable angular rock adequately sized for design flow. Preliminary rock size is specified in Table C.
  - Rock apron shall extend a minimum of 2 time pipe diameter downstream of outlet and be a minimum of 2 times pipe diameter wide. Apron may taper downstream on steeper gradient channels.
  - Rock shall be embedded into channel a minimum of 1.5 times maximum rock diameter. Subexcavate channel bed and banks in areas to receive rock. Rock shall be placed to form a uniform grade at the pipe outlet in a manner to prevent flow from eroding around the edge of the apron.
  - Separate rock from native soils with approved geotextile fabric if specified on plans or directed
  - Compact loose soils adjacent to rock rip rap

TABLE C

Pipe Diameter	D_{50} Rock Size (50% of rock larger than specified)	
	Diameter	Weight
< 18"	8+"	Gabion+
24"	12"	¼ T
36"	24"	½ T
48"	36"	1½ T

5H ENERGY DISSIPATER (Typical)

NTS

TIMOTHY C. BEST, CEG
ENGINEERING GEOLOGY AND HYDROLOGY
1002 Columbia Street, Santa Cruz, CA 95060
(831) 425-5832 (831) 425 5830 fax.

ENERGY DISSIPATER TYPICAL SPECIFICATIONS

Standard Detail 5H

Date: May 3, 2009

EROSION CONTROL BLANKETS AND MATS

Construction Specifications:

Site Preparation:

- Proper site preparation is essential to ensure complete contact of the protection matting with the soil.
- Grade and shape area of installation.
- Remove all rocks, clods, vegetative or other obstructions so that the installed blankets, or mats will have direct contact with the soil.
- Prepare seedbed by loosening 2-3 inches (50.8-76.2 mm) of topsoil above final grade.
- Incorporate amendments, such as lime and fertilizer, into soil according to soil test and the seeding plan.

Seeding:

- Seed area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all check slots and other areas disturbed during installation must be reseeded.
- Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Anchoring: U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats to the ground surface. Wire staples should be a minimum of 11 gauge. Metal stake pins should be 3/16 inch (4.8 mm) diameter steel with a 1 1/2 inch (38.1 mm) steel washer at the head of the pin. Wire staples and metal stakes should be driven flush to the soil surface. All anchors should be 6-8 inches (0.2-0.5 m) long and have sufficient ground penetration to resist pullout Longer anchors may be required for loose soils.

Installation on Slopes:

- Begin at the top of the slope and anchor its blanket in a 6 inch (0.2 m) deep x 6 inch (0.2 m) wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket downslope in the direction of the water flow.
- The edges of adjacent parallel rolls must be overlapped 2-3 inches (51-76 mm) and be stapled every 3 feet (0.9 m).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 inch (02 m) overlap Staple through overlapped area, approximately 12 inches (0.3 m) apart
- Lay blankets loosely and maintain direct contact with the soil -do not stretch.
- Blankets shall be stapled sufficiently to anchor blanket and maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 to 2:1, require 2 staples per square yard. Moderate slopes, 2:1 to 3:1, require 1-2 staples per square yard (1 staple 3' o.c.). Gentle slopes require 1 staple per square yard.

Installation in channels:

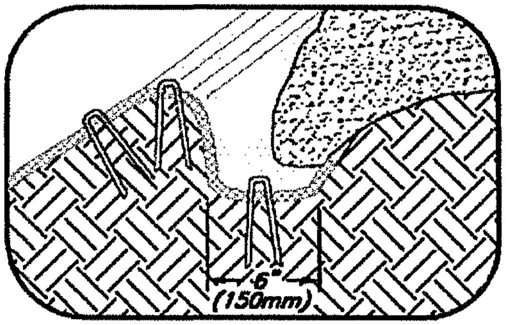
- Dig initial anchor trench 12 inches (0.3 m) deep and 6 inches (0.2 m) wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 inches (0.2 m) deep and 6 inches (0 2m) wide across the channel at 25-30 foot (7.6-9.1 m) intervals along the channeL
- Cut longitudinal channel anchor slots 4 inches (!Olmm) deep and 4 inches (101 nun) wide along each side of the installation to bury edges of matting. Whenever possible extend matting 2-3 inches (51-76 mm) above the crest of channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at I foot (.3m) intervals **Note:** matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 inches (7.6 em)
- Secure these initial ends of mats with anchors at I foot *(03* m) intervals, backfill and compact soiL
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench.
- Unroll adjacent mats upstream in similar fashion, maintaining a 3 inch (76 mm) overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at I inch (25 *A* mm) intervals, then backfill and compact soiL Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for noncritical installations: place two rows of anchors on 6 inch (0.2 m) centers at 25-30 feet (7.6-9.1 m) intervals in lieu of excavated check slots.
- Shingle-lap spliced ends by a minimum of I foot (0.3 m) with upstream mat on top to prevent uplifting by water or begin new rolls in a check slot. Anchor overlapped area by placing two rows of anchors, I foot (0.3 m) apart on I foot (0.3 m) intervals.
- Place edges of outside mats in previously excavated longitudinal slots, anchor using prescribed staple pattern, backfill and compact soiL
- Anchor, fill and compact upstream end of mat in a 12 inch (0.3 m) x 6 inch (0.2 m) terminal trench.
- Secure mat to ground surface using U-shaped wire staples geotextile pins or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil filling if specified for turf reinforcement:

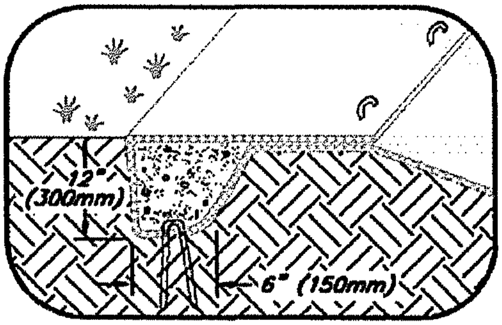
- After seeding, spread and lightly rake 1/2-.3/4 inches (12.7-19.1 mm) of fine topsoil into the mat apertures to completely fill mat thickness. Use backside of rake or other flat implement.
- Spread topsoil using lightweight loader, backhoe, or other power equipment Avoid sharp turns with equipment.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes or brooms for fine grading and touch up.
- Smooth out soil filling, just exposing top netting of matrix.

Inspection and Maintenance:

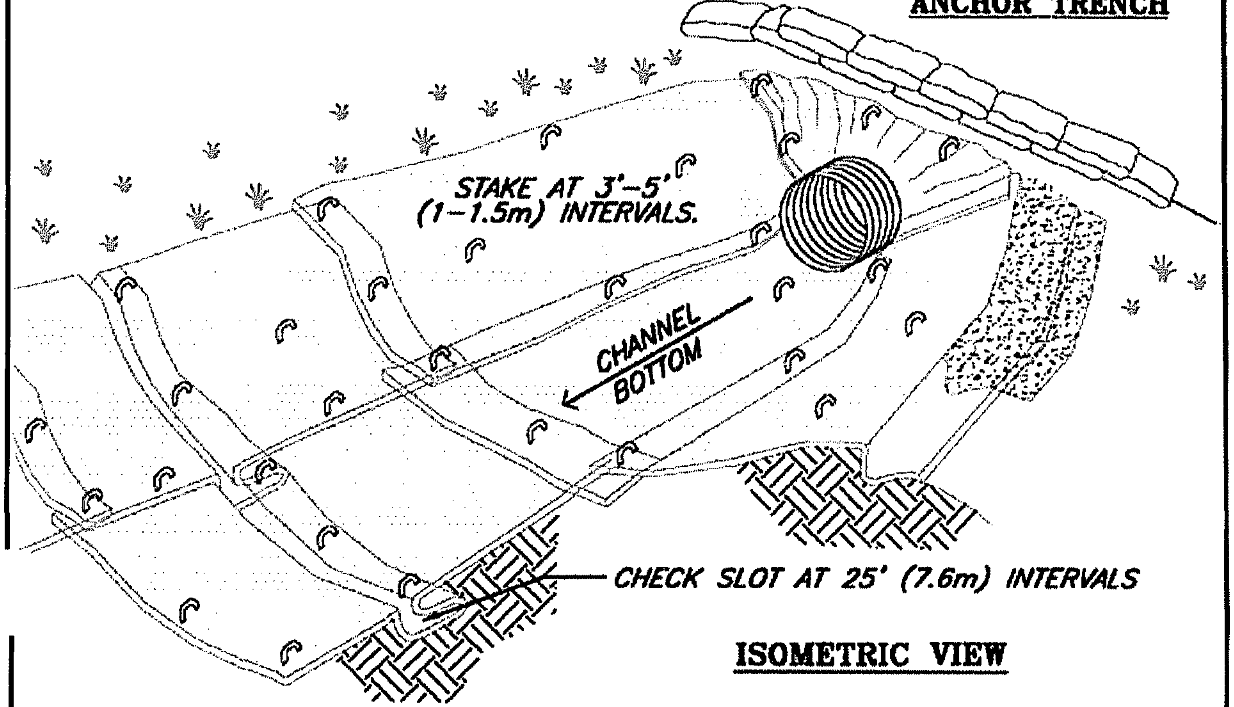
- All blanket and mats should be inspected periodically following installation.
- Inspect installation after significant rainstorms to check for erosion and undermining. Any failure should be repaired immediately.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or drainageway.



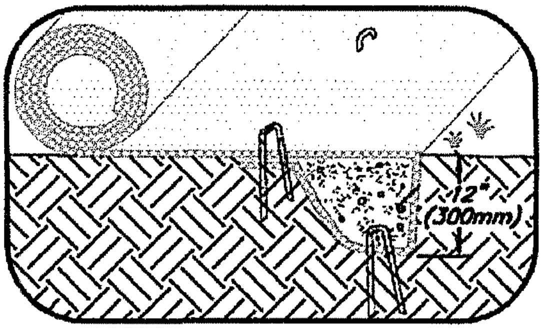
LONGITUDINAL ANCHOR TRENCH



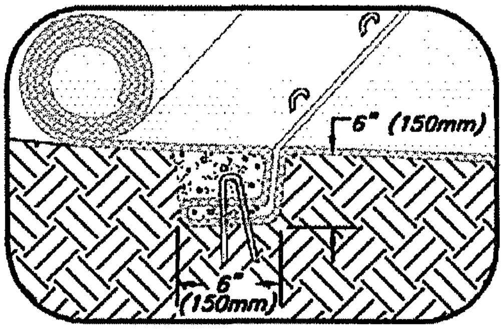
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH


STAKE AT 3'-5' (1-1.5m) INTERVALS.
CHANNEL BOTTOM
CHECK SLOT AT 25' (7.6m) INTERVALS

ISOMETRIC VIEW



INITIAL CHANNEL ANCHOR TRENCH



INTERMITTENT CHECK SLOT

NOTES.

1. *CHECK SLOTS TO BE CONSTRUCTED PER MANUFACTURERS SPECIFICATIONS.*
2. *STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.*

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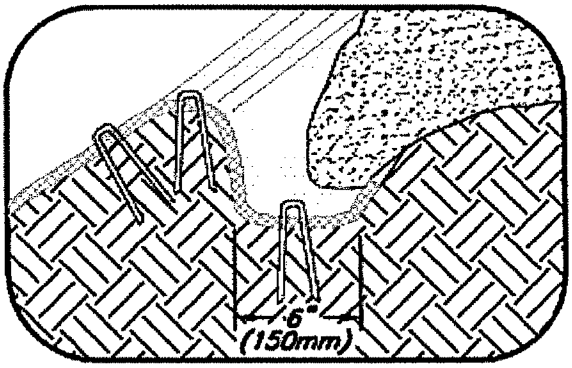
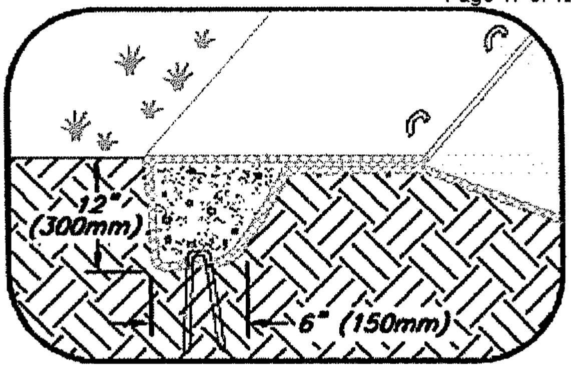
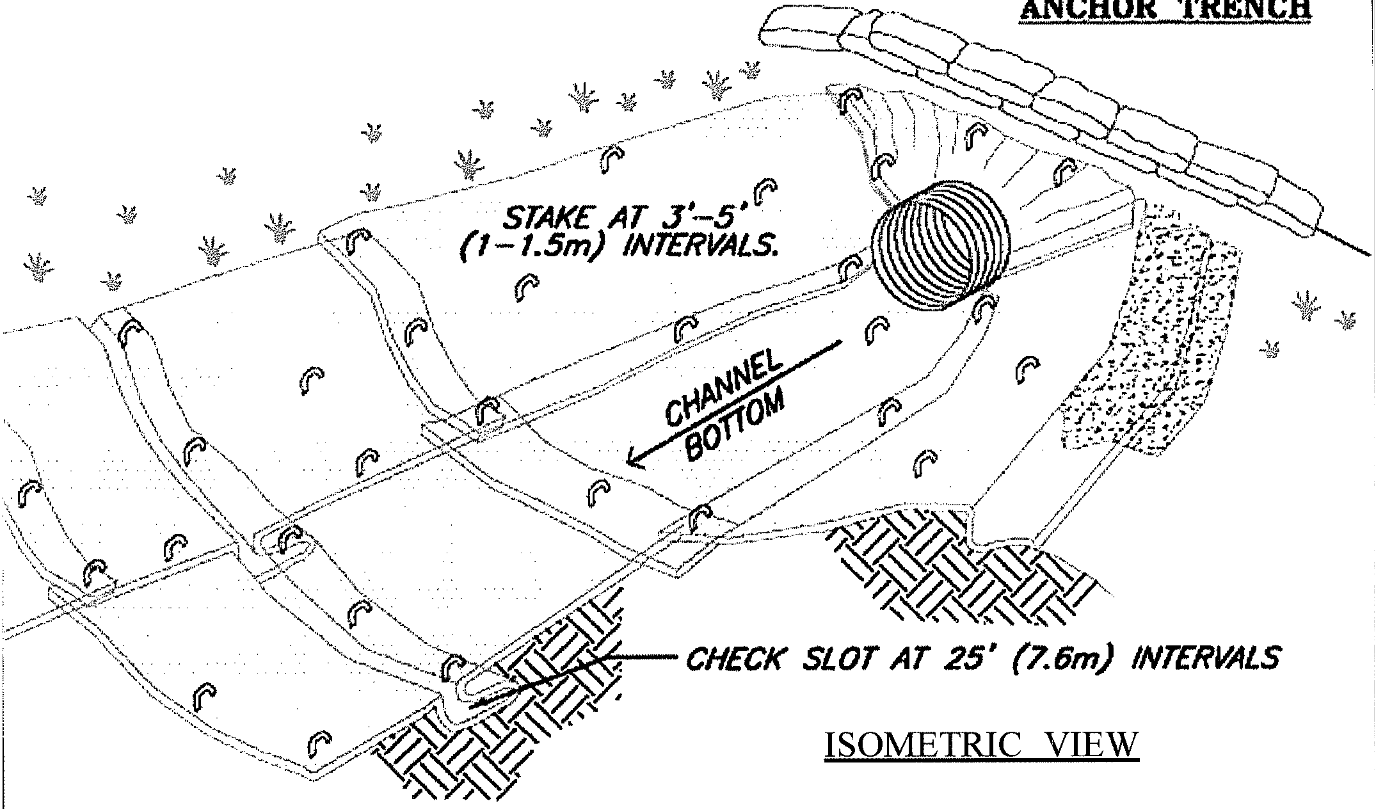
EROSION BLANKETS & TURF REINFORCEMENT MATS CHANNEL INSTALLATION



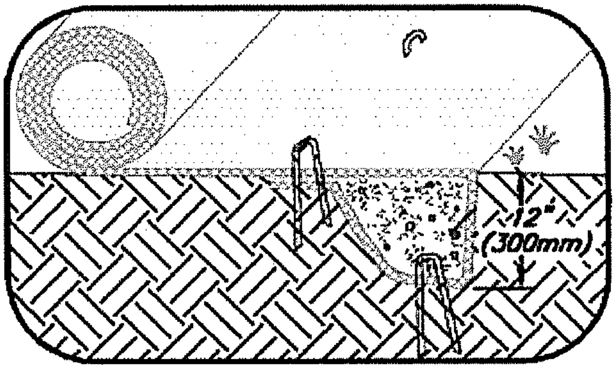
LONGITUDINAL ANCHOR TRENCH



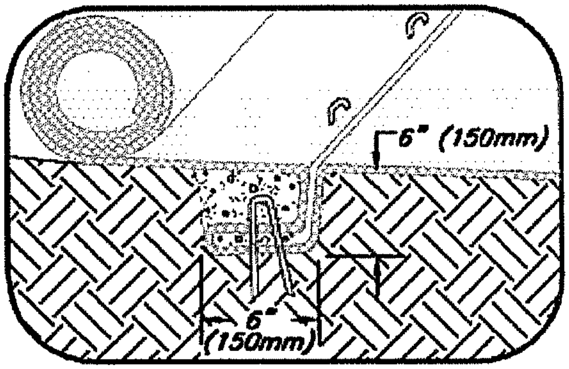
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH



ISOMETRIC VIEW



INITIAL CHANNEL ANCHOR TRENCH



INTERMITTENT CHECK SLOT

NOTES:

1. CHECK SLOTS TO BE CONSTRUCTED ***PER MANUFACTURERS SPECIFICATIONS.***

2. STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.

EROSION BLANKETS & TURF REINFORCEMENT MATS CHANNEL INSTALLATION

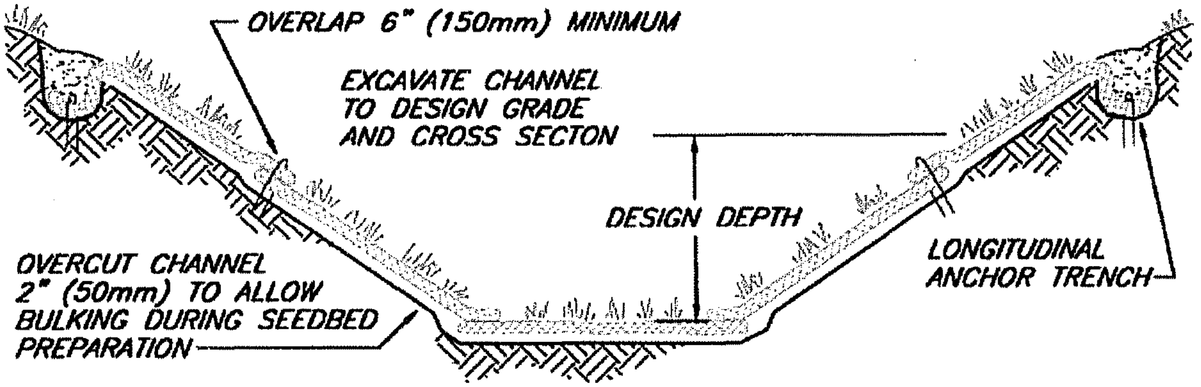
ALE: BLNICTCHA

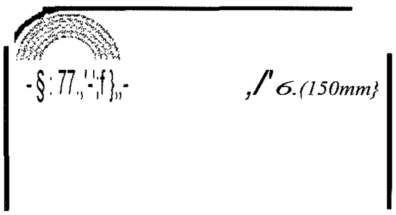
GRASSED-LINED CHANNELS

Construction Specifications: See Permanent Seeding and Erosion Control Blankets and Mats BMPs.

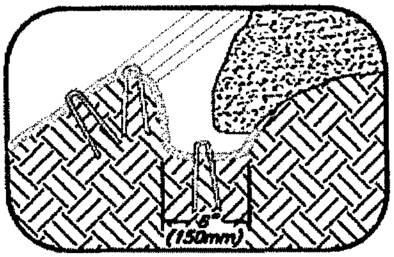
Inspection and Maintenance:

- During the initial establishment, grass-lined channels should be repaired and grass re-established if necessary.
- After grass has become established, the channel should be checked periodically to determine if the channel is withstanding flow velocities without damage.
- Check the channel for debris, scour, or erosion and immediately make repairs. It is particularly important to check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes and make repairs immediately,
- Remove all significant sediment accumulations to maintain the designed carrying capacity.
- Keep the grass in a healthy, vigorous condition at all times, since it is the primary erosion protection for the channel.
- Permanent grassed waterways should be seasonally maintained by mowing or irrigating, depending on the type of vegetation selected.


OVERLAP 6" (150mm) MINIMUM
EXCAVATE CHANNEL TO DESIGN GRADE AND CROSS SECTON
DESIGN DEPTH
OVERCUT CHANNEL 2" (50mm) TO ALLOW BULKING DURING SEEDBED PREPARATION
LONGITUDINAL ANCHOR TRENCH

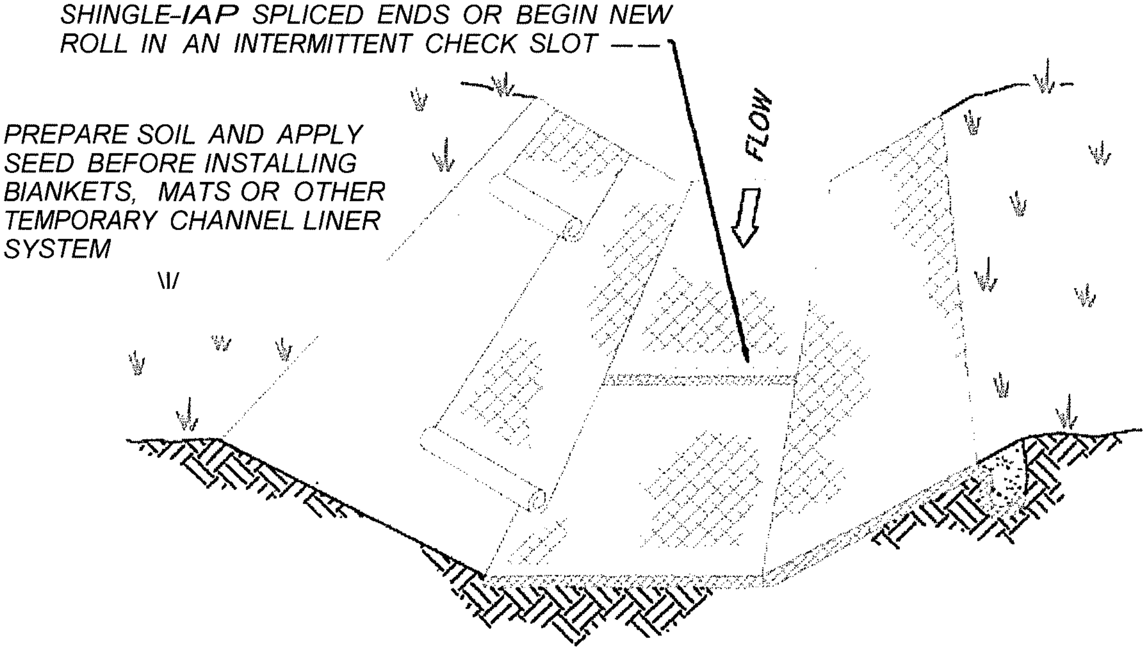


TYPICAL INSTALLATION WITH EROSION CONTROL BLANKETS OR TURF REINFORCEMENT MATS



INTE NT CHECK SLOT

LONGITUDINAL ANCHOR TRENCH


SHINGLE-LAP SPLICED ENDS OR BEGIN NEW ROLL IN AN INTERMITTENT CHECK SLOT
PREPARE SOIL AND APPLY SEED BEFORE INSTALLING BLANKETS, MATS OR OTHER TEMPORARY CHANNEL LINER SYSTEM
FLOW

NOT TO SCALE

NOTES:

1. DESIGN VELOCITIES EXCEEDING 2 FT/SEC (0.5m/sec) REQUIRE TEMPORARY BLANKETS, MATS OR SIMILAR LINERS TO PROTECT SEED AND SOIL UNTIL VEGETATION BECOMES ESTABLISHED.
2. GRASS-LINED CHANNELS WITH DESIGN VELOCITIES EXCEEDING 6 FT/SEC (2m/sec) SHOULD INCLUDE TURF REINFORCEMENT MATS.

GRASS-LINED CHANNEL
TYPICAL INSTALLATION

996 JOHN McCULLAH

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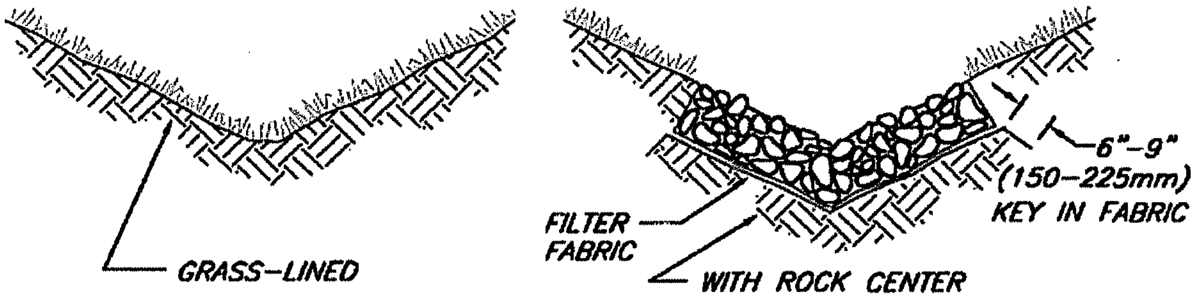
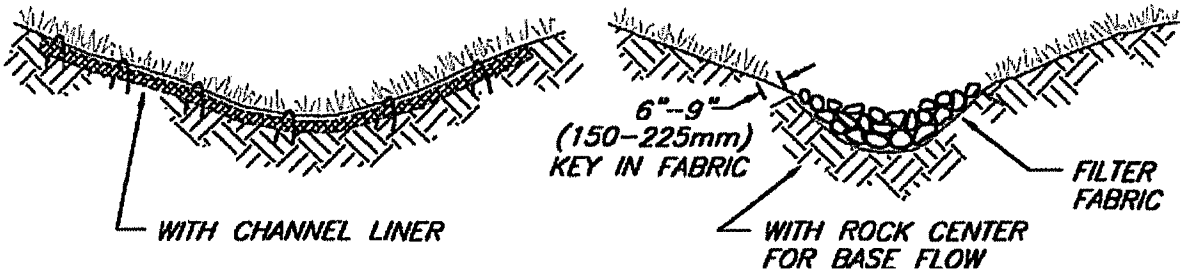
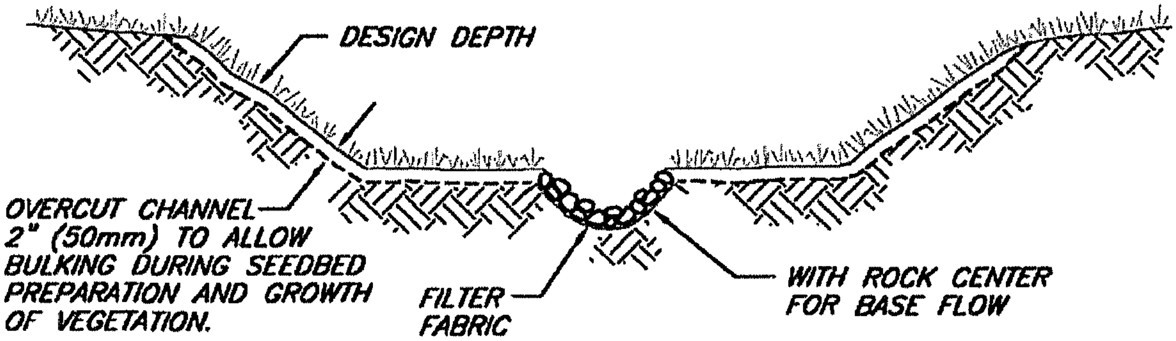


TYPICAL V-SHAPED CHANNEL
CROSS-SECTION


WITH CHANNEL LINER
6"-9" (150-225mm) KEY IN FABRIC
WITH ROCK CENTER FOR BASE FLOW
FILTER FABRIC

TYPICAL PARABOLIC CHANNEL
CROSS-SECTION


DESIGN DEPTH
OVERCUT CHANNEL 2" (50mm) TO ALLOW BULKING DURING SEEDBED PREPARATION AND GROWTH OF VEGETATION.
FILTER FABRIC
WITH ROCK CENTER FOR BASE FLOW

TYPICAL TRAPEZOIDAL CHANNEL
CROSS-SECTION

GRASS-LINED CHANNEL
TYPICAL CROSS SECTIONS

McCULLAH

FILE: CIIASS-XS

Instream Diversion Techniques

Definition: A stream diversion is a temporary bypass through a pipe, flume, or excavated channel that carries water flow around work areas. Stream diversion is commonly used during culvert installation or replacement. Where possible, a stream diversion should be the first choice to control erosion and sediment during the construction of culverts or other instream structures.

Purpose: During construction in a watercourse, particularly culvert installation and repair, these temporary water bypass structures are an effective sediment and erosion control technique.

Design Considerations: The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a pumped diversion include:

- Downstream sediment transport can almost be eliminated
- De-watering of the work area is possible
- Pipes can be moved about to allow construction operations
- The dams can serve as temporary access.
- Increased flows can be managed by adding more pumping capacity.

Some disadvantages of a pumped diversion are:

- Flow volume is limited by pump capacity
- Requires 24-hour monitoring of pumps
- Sudden rain could overtop dams
- Minor in-stream disturbance to install and remove dams

Advantages of excavated channels and flumes are:

- Isolates work from water flow and allows dewatering
- Can handle larger flows than pumps

Disadvantages of excavated channels and flumes are:

- Bypass channel or flume must be sized to handle flows, including possible floods
- Channels must be protected from erosion
- Flow diversion and then re-direction with small dams causes in-stream disturbance and sediment

Stream diversions should not be used:

- Without identifying potential impacts to the stream channel
- In or adjacent to water bodies until all necessary permits have been obtained

Instream Diversion Techniques (continued)

Construction Specifications:

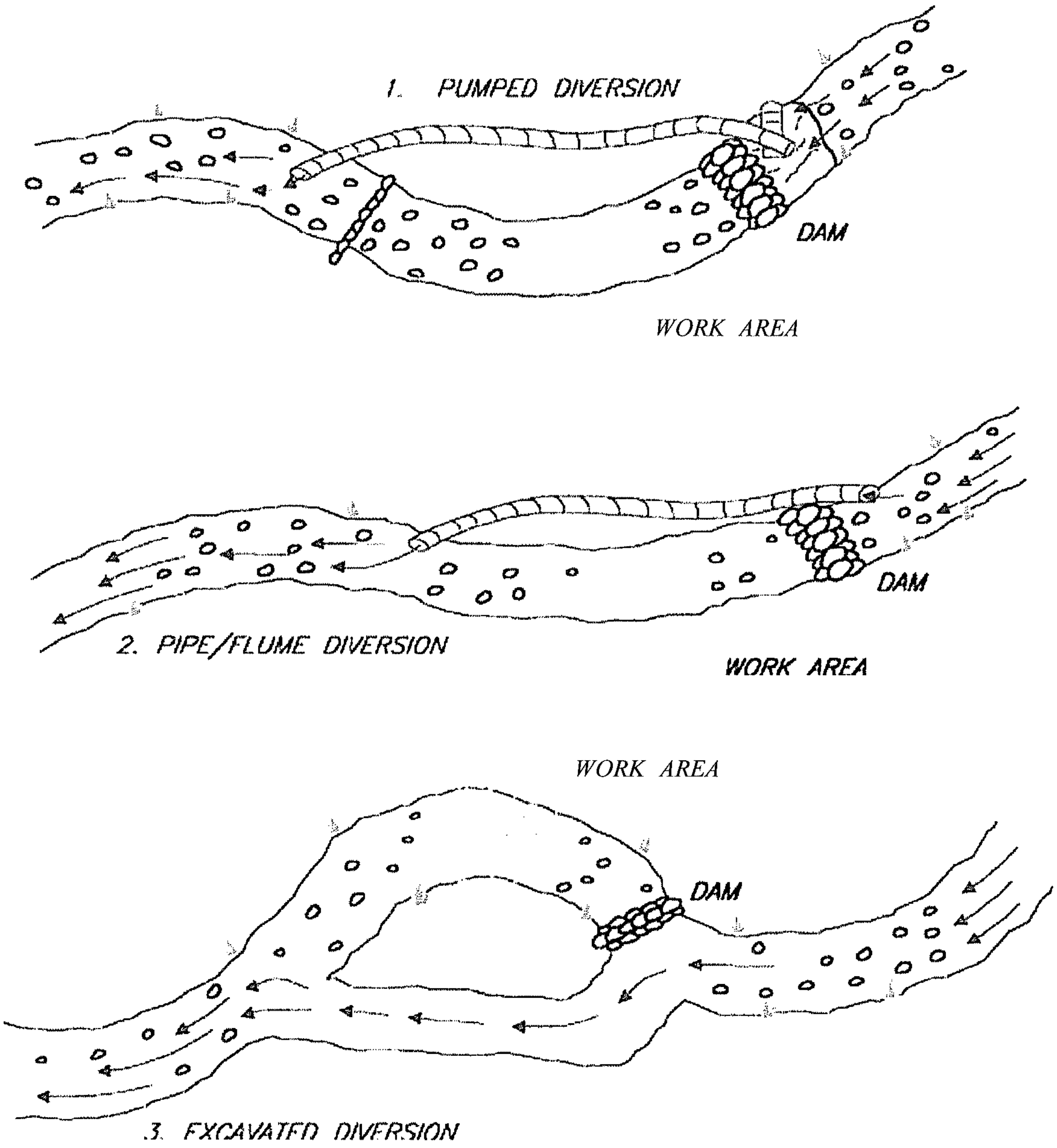
Guidelines will vary based on existing site conditions.

The pumped diversion is suitable for intermittent and low flow streams that can be pumped. Pump capacity must be sufficient for design flow. The upper limit is about 10ft^3/sec, the capacity of two 8 inch pumps. A temporary dam is constructed upstream and downstream of the work area and water is pumped through the construction project in pipes. Dam materials should be selected to be erosion resistant, such as steel plate, sheetpile, sandbags, continuous berms, inflatable water bladders, etc.

A temporary bypass channel can also be constructed by excavating a temporary channel or passing the flow through a heavy pipe (called a "flume), and excavating a trench under it. Typical stream sizes are less than 20 ft wide and less than 100 ft^3/sec.

Inspection and Maintenance:

- All stream diversions must be closely maintained and monitored
- Pumped diversions require 24-hour monitoring of pumps
- Upon completion of the work performed, the stream diversion should be removed and flow should be re-directed through the new culvert or back into the original stream channel.



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TYPICALSTREAM DIVERSION TECHNIQUES

R 1 8Wrnffi OMR S I00 -------------- ===================================

Instream Isolation Techniques

Definition: An instream isolation technique is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. The structures may be made of rock, sand bags, wood or water-filled geotextiles (aqua barriers).

Purpose: During construction in a watercourse, these structures are designed to reduce turbidity and sediment discharge, allowing contractors to follow clean water regulations.

Design Considerations: Isolation structures may be used in construction activities such as streambank stabilization, culvert installation, bridges, piers or abutments. It may be used in combination with other methods such as clean water bypasses and/or pumps.

This technique should not be used:

- If there is insufficient streamflow to support aquatic species
- In deep water unless designed or reviewed by an engineer
- To completely dam streamflows

Construction Specifications: When used in watercourses or streams, cofferdams must be used in accordance with permit requirements. Materials for cofferdams should be selected based on ease of maintenance and complete removal following construction activities.

Inspection and Maintenance:

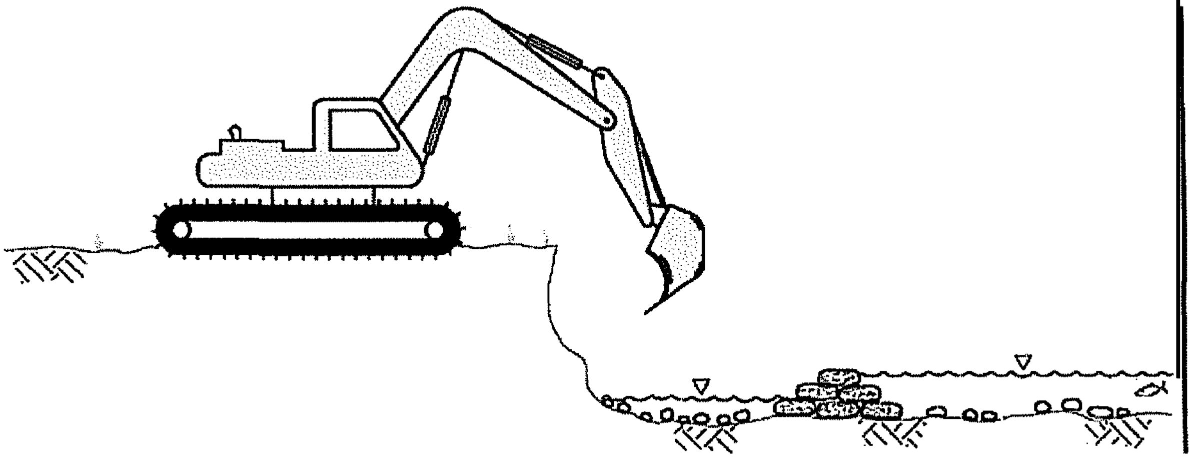
- During construction, inspect daily during the work week.
- Schedule additional inspections during storm events.
- Immediately repair any gaps, holes or scour.

Upon construction completion, the structure is removed.

- Remove sediment buildup.
- Remove structure. Recycle or re-use if applicable.
- Revegetate areas disturbed by cofferdam removal if applicable.

BENEFITS/LIMITATIONS

- *Difficult to dewater*
- *Inexpensive*
- *Labor intensive to install and remove*
- *Sand may be deposited in stream if bags break. better to use clean gravel*



SAND BAG/GRAVEL BAG TECHNIQUE

INSTREAM EROSION AND SEDIMENT CONTROL ISOLATION TECHNIQUES

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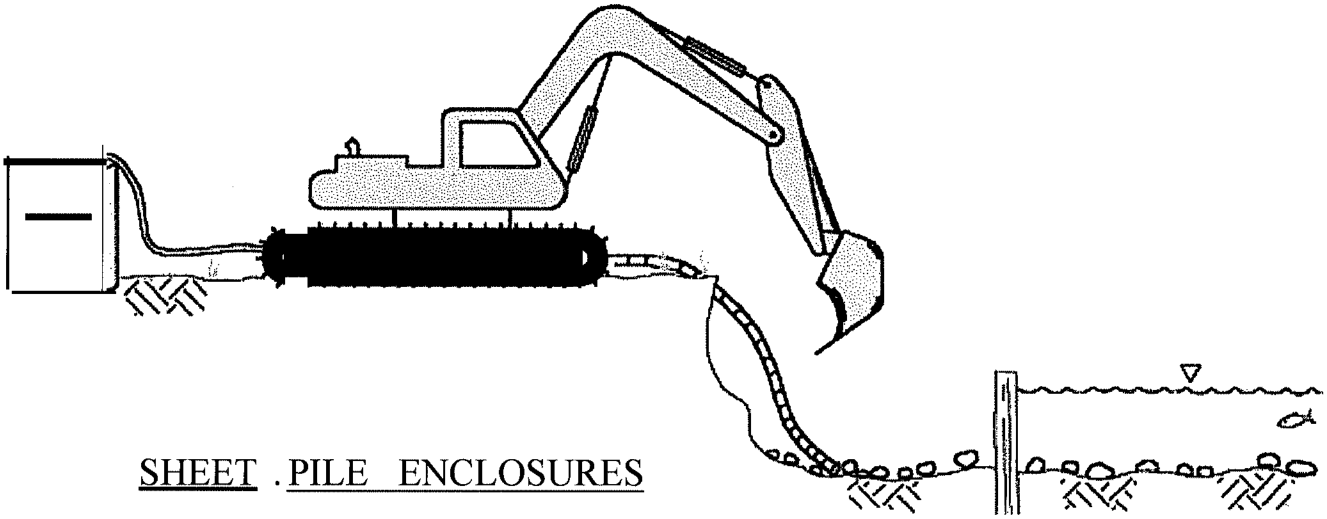
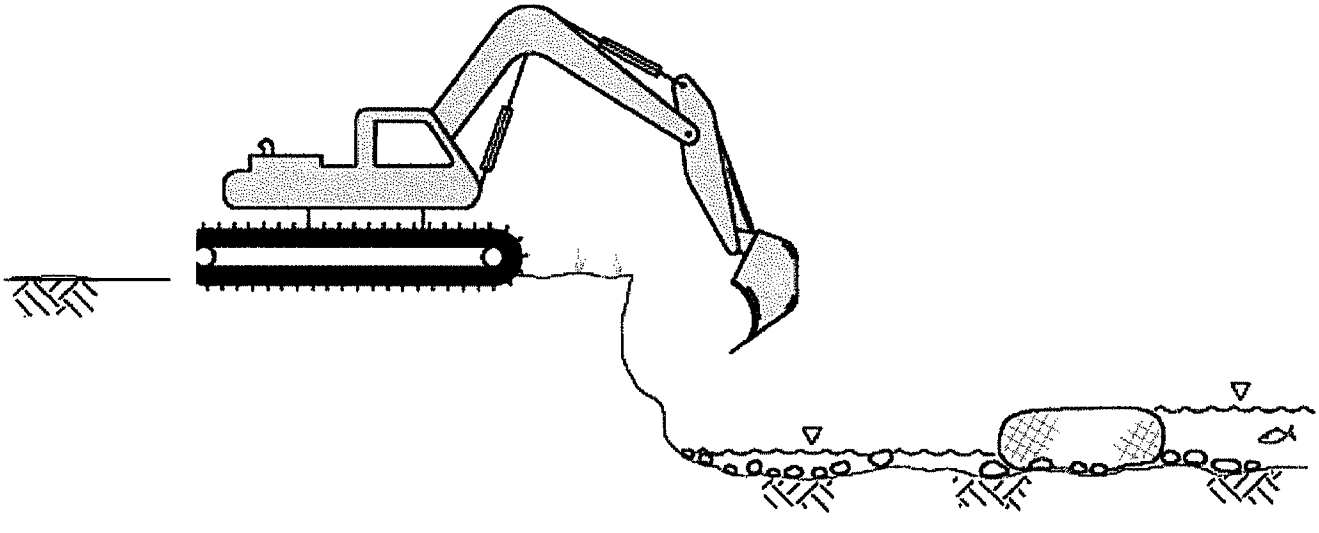
FILE: INSTREAM TECHNIQUES3

BENERTS/LIMIT14TIONS
- *-Allows full dewatering*
- *.Relatively expensive*
- *.useful in lorge rivers, lakes, high velocity*
- *-Not really appropriate for small streams*
- *.Requires staging and heavy equipment access areas*



SHEET . PILE ENCLOSURES

BENEFITS/LIM/TAliONS
- *.Allows partial dewatering*
- *.Moderately expensive*
- *.fose of installation and removal unknown*
- *.con be designed for small streams to lorge rivers*



WATER-FILLED GEOTEXTILE (AQUA DAM)

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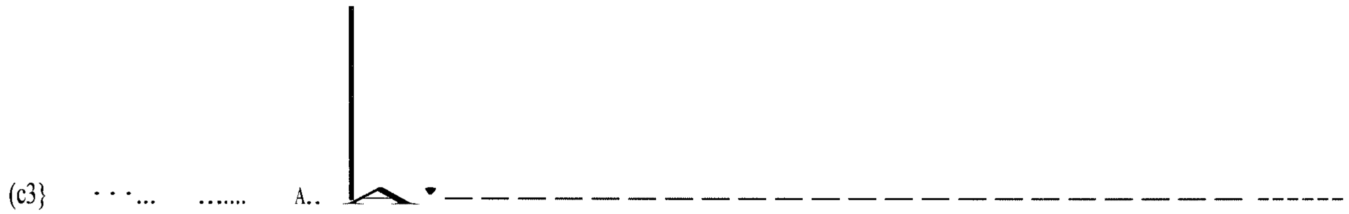
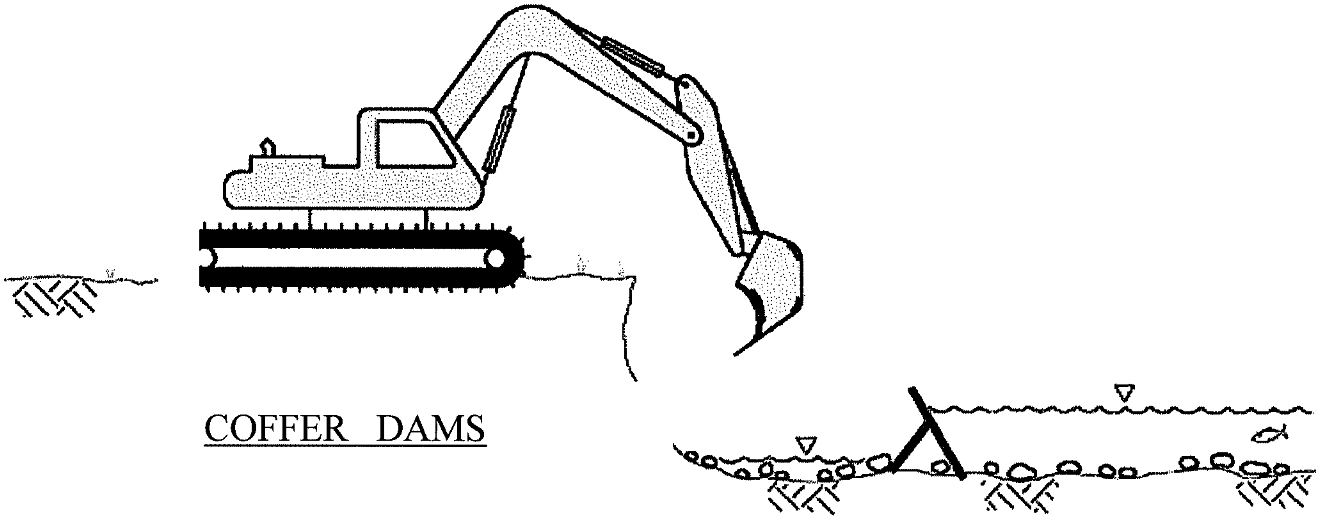
INSTREAM EROSION AND SEDIMENT CONTROL ISOLATION " GHttS

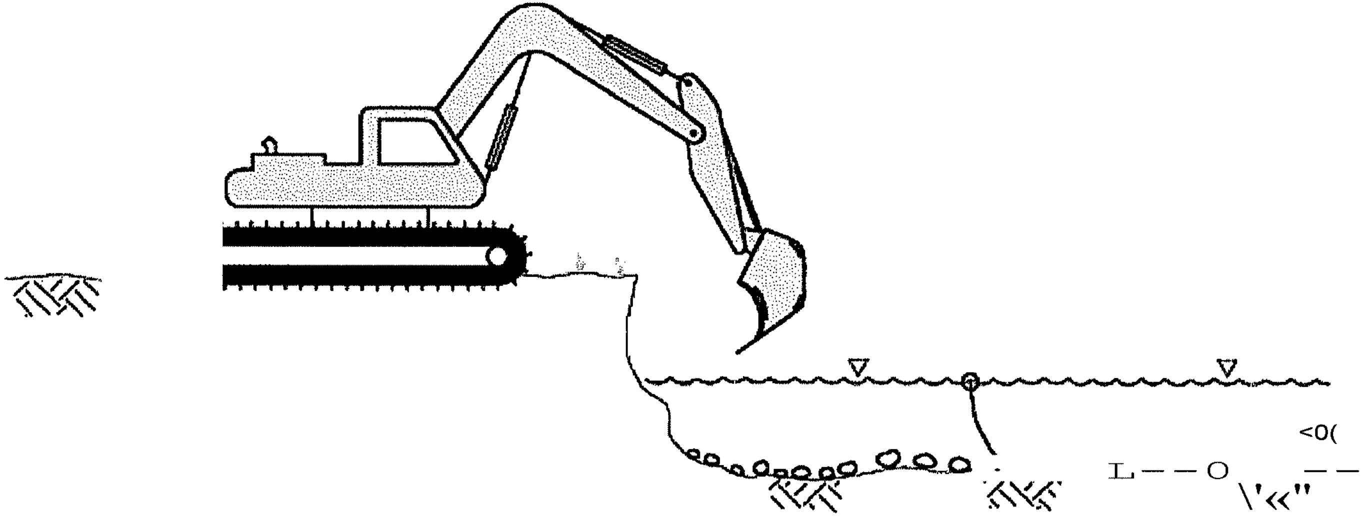

(c3}
A..

BENEFITS/LIMITATIONS
.Allows partial dewatering
·Many different types available
.Relatively expensive
.can be designed for large and small streams
.Ease of installation and removal unknown



COFFER DAMS

BENEFITS/LIMITATIONS
.Does not allow dewatering
.Inexpensive
.Used in slow water or lakes only
.Not very effective especially when removing



GEOTEXTILES. SILT BARRIERS. CURTAINS

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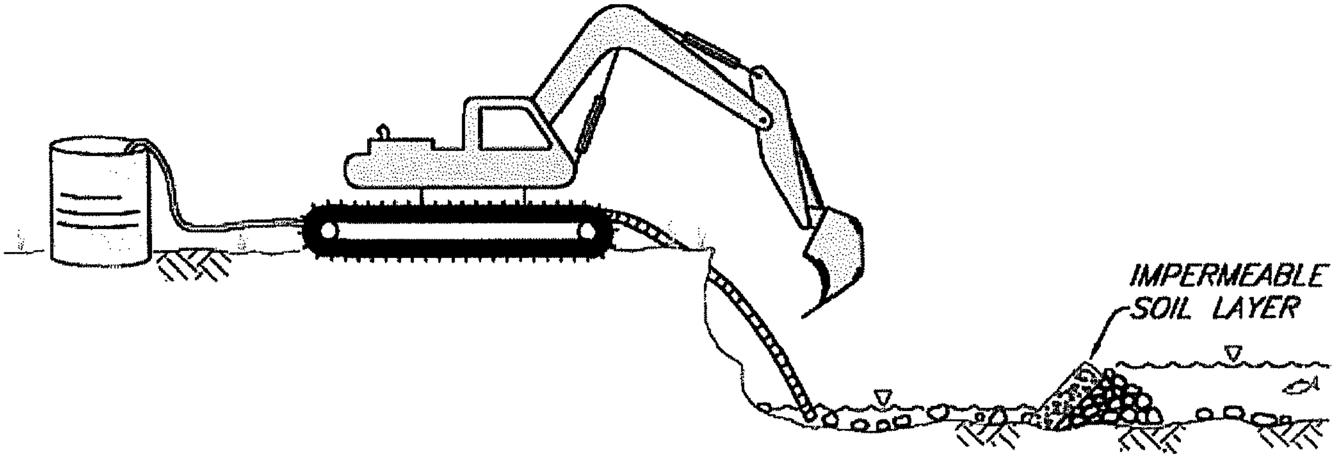
INSTREAM EROSION AND SEDIMENT CONTROL ISOLATION TECHNIQUES

BENEFITS/LIMITATIONS
·Allows partial dewatering
.Relatively inexpensive
.useful for small streams
.Minimal TSS when removed



NOTES:

Step 1. Install clean gravel

Step 2. Place impermeable soil

Step 3. Do work

Step 4. Decommission berm by removing soil loyer first

Step 5. Pump work area. Head differential will cause turbid wafer to flow into work area through gravel

Step 6. Remove or spread gravel

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GRAVEL/SOIL BERM INSTREAM ISOLATION TECHNIQUE

Large Woody Debris Management and Removal

Large woody debris (LWD) in streams has many positive benefits to the aquatic environment, including increased habitat complexity for resident trout, amphibians, and birds, as well as a host of plants and fungus. Large wood also performs geomorphic functions within stream channels such as grade control, bank stabilization, and stream bedload (cobbles and gravel) scour and sorting. The goal of large wood management is to retain as much wood as possible. Large wood is defined as logs with a diameter of 6" or greater and a length of 10' or longer, rootwads and stumps.

There are, however, situations where large wood maintenance can be in conflict with the maintenance of District infrastructure such as roads, bridges, and culverts. These conflicts arise when LWD accumulates around bridge footings, culvert inlets and outlets, and adjacent to roads or structures. Redirection of flow, and streambed elevation changes associated with the LWD accumulation, towards District facilities, can lead to the catastrophic failure of these facilities. In these limited circumstances, LWD will need to be managed or removed. Planning and Operations staff will confer regarding the specific course of action.

Management and removal will be undertaken only as a last resort to mitigate ongoing or imminent damage. Locations will be assessed for sensitive species prior to beginning any work at the site. LWD shall be managed to maintain as much LWD in the stream channel as possible. Often, smaller branches and logs accumulate on a few large key log pieces, and it is possible to pick through the smaller material maintaining the large key pieces for habitat and geomorphic function. LWD can also be rearranged or relocated within the stream channel, to decrease hazard to District infrastructure, and maintain LWD within the channel. These become sites that will need periodic maintenance and is the preferred method of LWD management on District Preserves.

There are also isolated circumstances where LWD has to be removed from the channel where the potential for catastrophic failure of District infrastructure is so great that no other alternative exists to protect the infrastructure. This option will only be employed where an evaluation has been made by Planning and Operations staff, which concludes that LWD management as described in the paragraph above is not sufficient to address the heightened level of concern. Again, the volume of LWD removed will be minimized to maintain as much LWD in channel as possible. LWD removed from the channel that cannot be immediately incorporated within the stream at a nearby location, shall be stockpiled for future use. LWD removed shall be left as large as possible for incorporation into future projects, particularly large logs and rootwads with attached bole. Smaller pieces of LWD shall be removed to above the high water mark of the channel, and can be stacked or spread for terrestrial habitat

All work involving in-channel LWD will be completed by hand crews. No heavy equipment will be operated within the stream channel, or live flowing water. Hand crews may be aided by heavy equipment if it can be operated from an existing access road adjacent to the project site. No fueling of chain saws will occur within the stream channel, and will be done at a location where fuel can not enter the watercourse.

LWD project sites will be surveyed by a qualified biologist prior to beginning any work to determine if any sensitive species are present Appropriate agency consultations will be conducted if listed species are identified during pre-construction surveys or encountered during construction.

Live Pole Drains

A live pole drain is a biotechnical and reclamation technique which is intended to drain excess moisture away from an unstable site. The plants used to construct the bundles (willow) will sprout and grow, with the moisture continuing to drain from the lower end. The bundles of cuttings are usually placed in shallow trenches in a manner that they intersect and collect excessive slope moisture. That excess water is then allowed to drain onto a stabilized area.

Conditions Where Practice Applies

Unstable slopes, landslides, and small slumping gullies can often be successfully treated with live pole drains. This is a good technique to initiate the process of natural healing.

Materials

Use fascine or wattle techniques to construct the bundles. Keep some of the twigs and branches on the cuttings, as this will add bulk and aid drainage. Live pole drain bundles can be constructed using branches which are longer than those typically used for wattles or fascines. Live pole drains require construction stakes and/or live stakes in order to secure them firmly to the slope. Sometimes large rocks may also be used to hold the drains down.

Advantages

If constructed from willow species, live pole drains will provide cover for the site and initial stabilization while allowing other species to invade. The pole drains will continue to grow for an extended period, while allowing drainage to occur.

David Polster, M.Sc., R.P. Bio. Plant Ecologist, British Columbia, has been extremely successful using live pole drains for landslides and gullies. He has completed projects where the pole drains have provided initial stability and then drained water for years after establishment.

Disadvantages

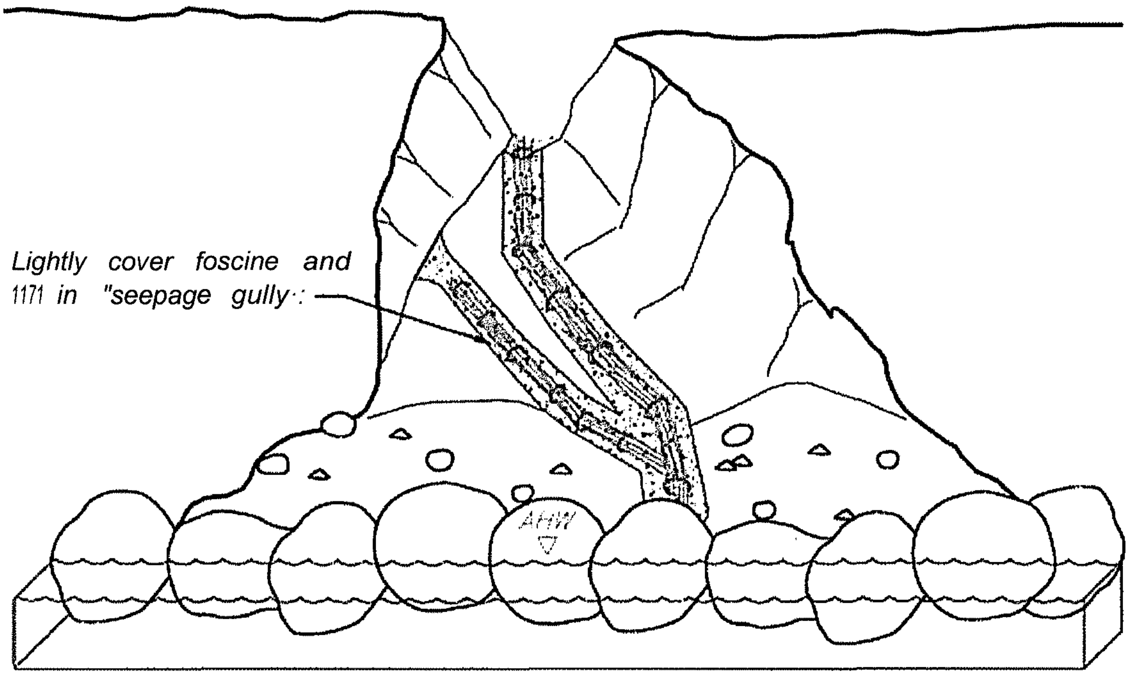
Live pole drains are not effective in larger, well defined channels with concentrated flows, as the pole drains will simply plug the channel and cause more erosion as the channel adjusts to maintain capacity. Biotechnical projects are typically conducted at times of the year when weather conditions are cool and moist and the plant material is dormant. Timing constraints can sometimes be ameliorated by irrigation, storage of plant materials, or a combination of the above. However, some reduction of plant establishment and vigor should be anticipated.

Live Pole Drains (continued)

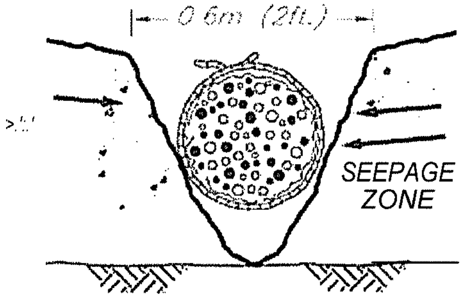
Implementation

The key to successful pole drain construction is to install the drains in the areas of seepage, either by excavating a shallow trench or utilizing an existing drainage gully, so the drains intercept and control the excess moisture. Use fascine or wattle techniques to construct the bundles. The bundles should be tied tightly with twine or rope. Place the bundle of cuttings in the trench. Construct side drains as needed. It is important to key the bundles into each other by jamming the ends firmly together.

Use construction stakes and/or live stakes to hold the fascines in place. Insert the stakes adjacent to the rope ties for additional support. Stake the pole drains at 1-2 m intervals. Lightly backfill the bundles with native soil. Some twigs and branches should be left above the ground as the willow material requires some sunlight exposure to grow.

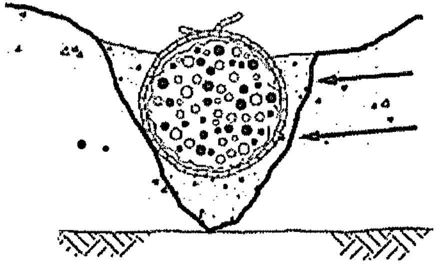


Lightly cover fascine and fill in "seepage gully".



Excavate a shallow trench or utilize existing "seepage gully" (small<2ft.^{2})

Lightly cover fascine.



Place bundle of cuttings (fascine) in the trench and lightly backfill with native material.

NOTES:

1. Live pole drain is a biotechnical technique which drains excess moisture from the bank and provides an initial cover of woody vegetation.
2. The cuttings used to form the fascines are intended to sprout and grow while the excess moisture continues to drain from the lower end.

LIVE POLE DRAIN

2004 SALIX

Live Siltation

Live siltation is a revegetation technique used to secure the toe of a streambank, trap sediments, and create fish rearing habitat. The system can be constructed as a living or a non-living brushy system at the water's edge.

Conditions Where Practice Applies

Live siltation is a biotechnical technique for the edges of rivers and streams. This technique is useful along stream reaches where it is desired to encourage deposition and siltation, such as floodplains and along inner banks. It would not be an appropriate practice along an outer bend without sufficient scour or toe protection.

Materials

Natural stone, willow wattles, logs or root wad revetments are needed for toe and scour protection. The live siltation will require live branches of shrub willows of 1-1.5 m length. The branches should be dormant, and need to have the side branches still attached. Any woody plant material, such as alder, can be installed for a non-living system.

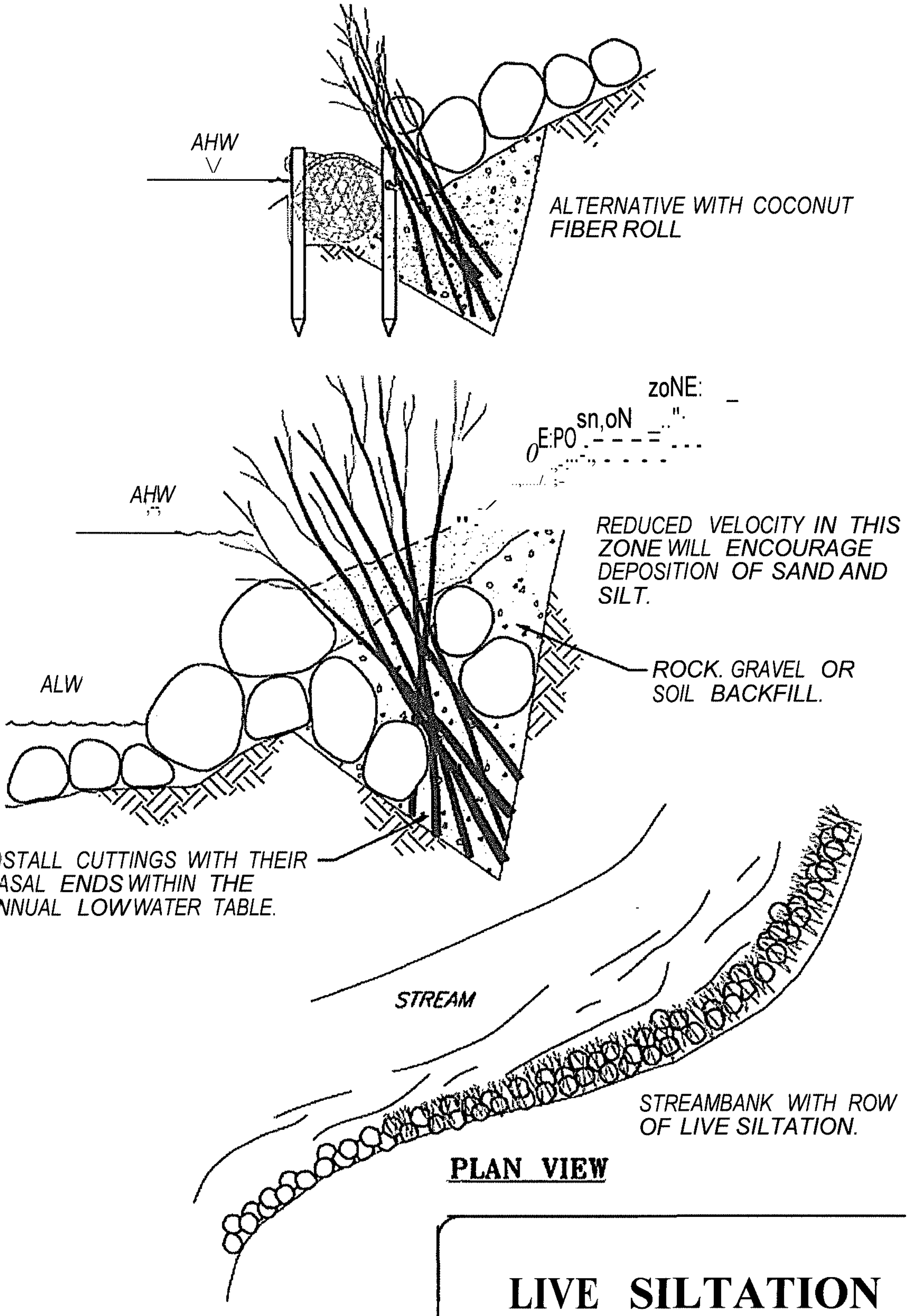
Advantages

This is a very effective and simple conservation method using local plant materials. This technique is particularly valuable for providing immediate cover and fish habitat while other revegetation plantings become established. The protruding branches provide roughness, slow velocities, and encourage deposition of sediment. The depositional areas are then available for natural recruitment of native riparian vegetation.

Implementation

Construct a V-shaped trench at the mean high water (MHW) level, with hand tools or a backhoe. Excavate a trench so that it parallels the toe of the streambank and is approximately 2 feet deep. Lay a thick layer of willow branches in the trench so that 1/3 of the length of the branches is above the trench and the branches angle out toward the stream. Place a minimum of 40 willow branches per meter in the trench.

Backfill over the branches with a gravel/soil mix and secure the top surface with large washed gravel, bundles/coir logs, or carefully placed rocks. Both the upstream and downstream ends of the live siltation construction need to transition smoothly into a stable streambank to reduce the potential for the system to wash out. More that one row of live siltation can be installed. A living and growing siltation system typically is installed at MHW. A non-living system can be constructed below MHW during low water levels. If it is impossible to dig a trench, the branches can be secured in place with logs, armor rock, bundles made from wattles, or coir logs.


AHW
ALTERNATIVE WITH COCONUT FIBER ROLL
DEPOSITION ZONE
AHW
REDUCED VELOCITY IN THIS ZONE WILL ENCOURAGE DEPOSITION OF SAND AND SILT.
ALW
ROCK. GRAVEL OR SOIL BACKFILL.
INSTALL CUTTINGS WITH THEIR BASAL ENDS WITHIN THE ANNUAL LOWWATER TABLE.
STREAM
STREAMBANK WITH ROW OF LIVE SILTATION.
PLAN VIEW

LIVE SILTATION

2004 SALIX

Modified Live Siltation

Conditions Where Practice Applies

Use modified live siltation for the inner bends of streams or areas periodically flooded.

Modified live siltation can be placed in a manner which can direct high flows toward the center of the stream, while providing hydraulic roughness which will encourage deposition and siltation.

Materials

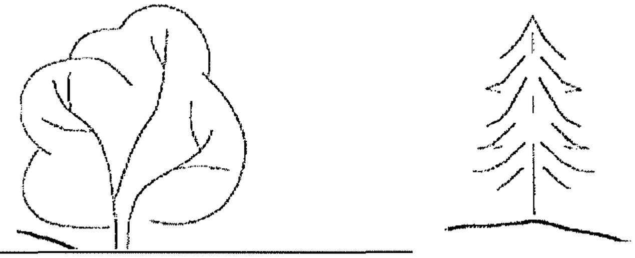
Primarily willow species are used for live siltation, however, even dead branches and non-living bundles can provide the desired hydraulic roughness. The willow species will generally thrive in depositional areas. Use willow wattles and live staking or poles. Rope will be needed for bundles, and wooden stakes will be needed to secure wattles.

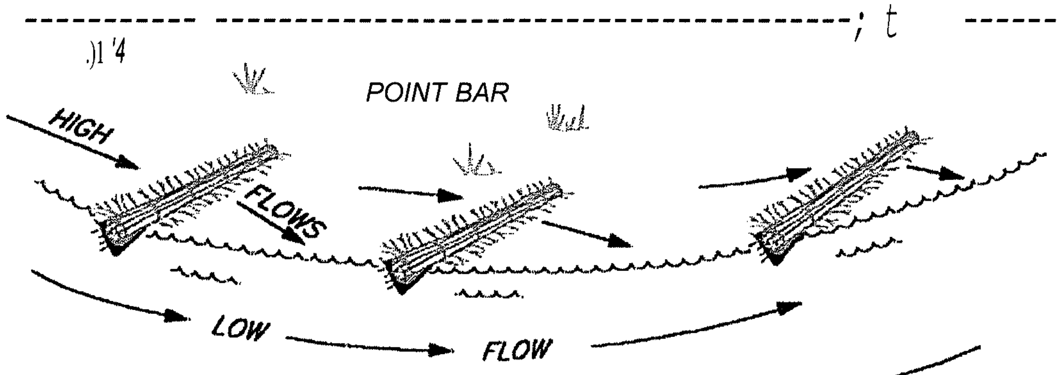
Advantages

This is an inexpensive revegetation and stream stabilization technique which provides habitat enhancements and encourages deposition.

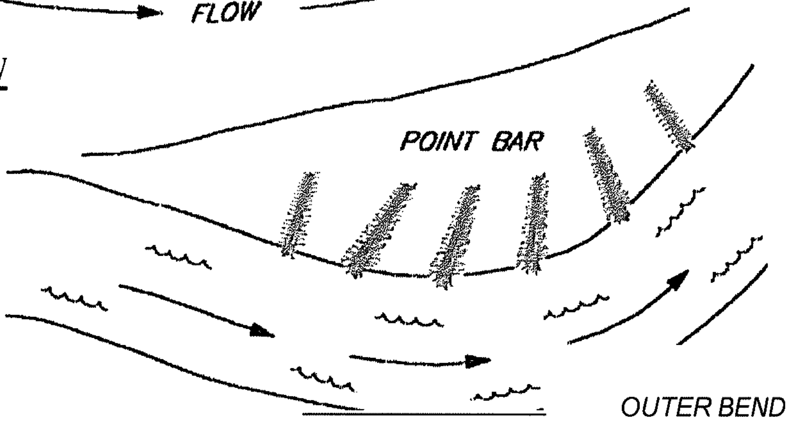
Implementation

Prepare trenches. Trenches for modified live siltation should point in a slight upstream direction, no more than 20 degrees. Lay live willow bundle or dead branch bundle into trench. Secure the bundle firmly using wooden stakes. Lay in branches for live siltation. Backfill trench with soil and rock.

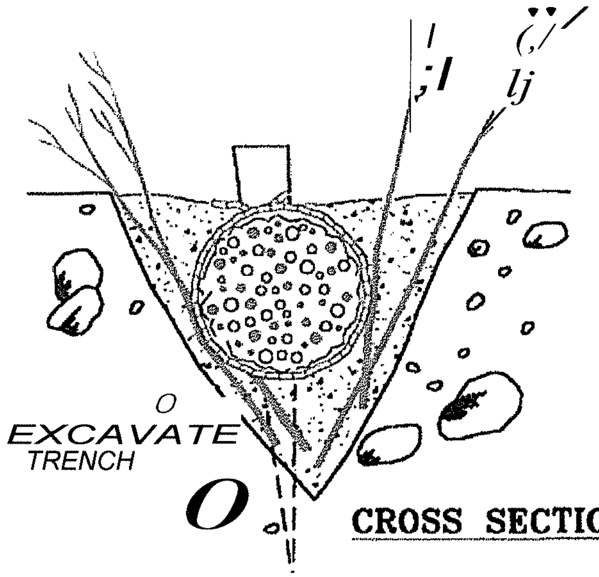




FRONT VIEW



PLAN VIEW



CROSS SECTION

NOTES:

1. Modified live S11lafion is a revegetation technique intended to encourage deposition (reduce erosion and scour) of the inner bend (point bar formation).
2. The vegetated spurs or live veins are angled slightly into the flow such that high flows will be red/reeled toward the center of the stream.

MODIFIED LIVE SILTATION

R E' uilln L .IUU

LIVE STAKING

Construction Specifications:

Harvesting;

- Stakes shall be harvested and planted when the willows, or other chosen species, are dormant This period is generally from late fall to early spring, or before the buds start to break

- When harvesting cuttings, select healthy, live wood that is reasonably straight.

- Use live wood at least 1 year old or older- Avoid suckers of current years growth as they lack sufficient stored energy reserves to sprout consistently. The best wood is 2-5 years old with smooth bark that is not deeply furrowed.

- Make clean cuts with unsplit ends. Trim branches from cutting as close as possible. The butt end of the cutting shall be pointed or angled and the top end shall be cut square.

- Identification of the top and bottom of cutting as accomplished by angle cutting the butt end. The top, square cut, can be painted and sealed by dipping the top 1-2 inches (25-51 mm) into a 50-50 mix of light colored latex paint and water. Sealing the top of stake will reduce the possibility of desiccation and disease caused mortality, assure the stakes are planted with the top up, and makes the stakes more visible for subsequent planting evaluations

Diameter:

- Cuttings should generally be 3/4 inch (19 mm) or larger depending on the species. Highest survival rates are obtained from using cuttings 2-3 inches (51-76 mm) in diameter Larger diameter cuttings are needed for planting into rock riprap.

Length:

- Cuttings of small diameter (up to 1 1/2 inches (38 mm)) shall be 18 inches (0.5 m) long minimum. Thicker cuttings should be longer.

- Cuttings should be long enough to reach into the mid-summer water table, if possible.

- No less than 112 total length must be into the ground.
- Stakes should be cut so that a terminal bud scar is within 1-4 inches (25-101 mm) of the top At least 2 buds and/or bud scars shall be above the ground after planting.

Installation:

- Stakes must be planted with butt-ends into the ground. Leaf bud scars or emerging buds should always point up.

- Stakes must not be allowed to dry out All cuttings should be soaked in water for a minimum of 24 hours. Soaking significantly increases the survival rate of the cuttings, however they may be planted the same day they are harvested.

- Plant stakes 1-3 feet (0.3-1 m) apart.

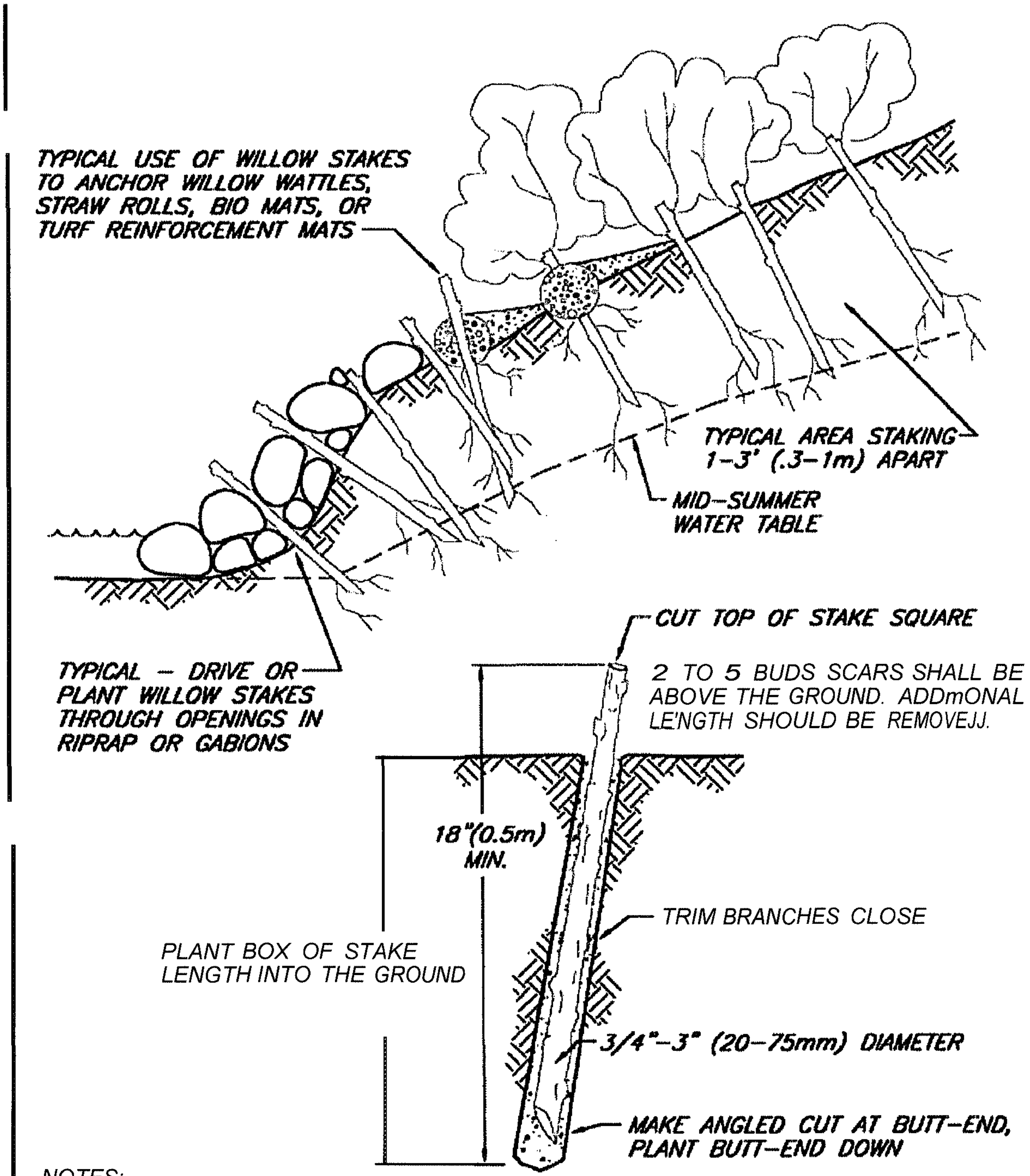
- Set the stake as deep as possible into the soil, preferably with 80 percent of its length into the soil and in contact with mid-summer water table.

- It is essential to have good contact between the stake and soil for roots to sprout Tamp the soil around the cutting

- Use a iron stake or bar to make a pilot hole in firm soiL
- Do not damage the buds, strip the bark or split the stake during installation.
- Split or damaged stakes shall be removed and replaced,

Inspection and Maintenance:

- All temporary and permanet erosion and sediment control practices shall be maintained and repaired as needed to assure continued performance of their intended function.
- Streambanks and steep slopes are highly susceptible to erosion and damage from significant storm events. Willow stakes alone provide very little initial site protection during the establishment period.
- Periodic inspection repair and maintenance will be required during the first two years or until the vegetation is established.
- All temporary or permanent erosion control practices shall be maintained and repaired as needed to assure continued performance of their intended function.


TYPICAL USE OF WILLOW STAKES TO ANCHOR WILLOW WATTLES, STRAW ROLLS, BIO MATS, OR TURF REINFORCEMENT MATS
TYPICAL AREA STAKING 1-3' (.3-1m) APART
MID-SUMMER WATER TABLE
TYPICAL - DRIVE OR PLANT WILLOW STAKES THROUGH OPENINGS IN RIPRAP OR GABIONS
CUT TOP OF STAKE SQUARE
2 TO 5 BUDS SCARS SHALL BE ABOVE THE GROUND. ADDITIONAL LENGTH SHOULD BE REMOVED.
18"(0.5m) MIN.
TRIM BRANCHES CLOSE
PLANT BOX OF STAKE LENGTH INTO THE GROUND
3/4"-3" (20-75mm) DIAMETER
MAKE ANGLED CUT AT BUTT-END, PLANT BUTT-END DOWN

NOTES:
1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON.
2. USE HEALTHY. STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION, USE A PILOT BAR IN FIRM SOILS.
4. SOAK CUTTINGS FOR 24 HOURS {MIN.) PRIOR TO INSTALLATION.
5. TAMP THE SOIL AROUND THE STAKE.

NOT TO SCALE:

LIVE STAKING

FILE: LNESTI

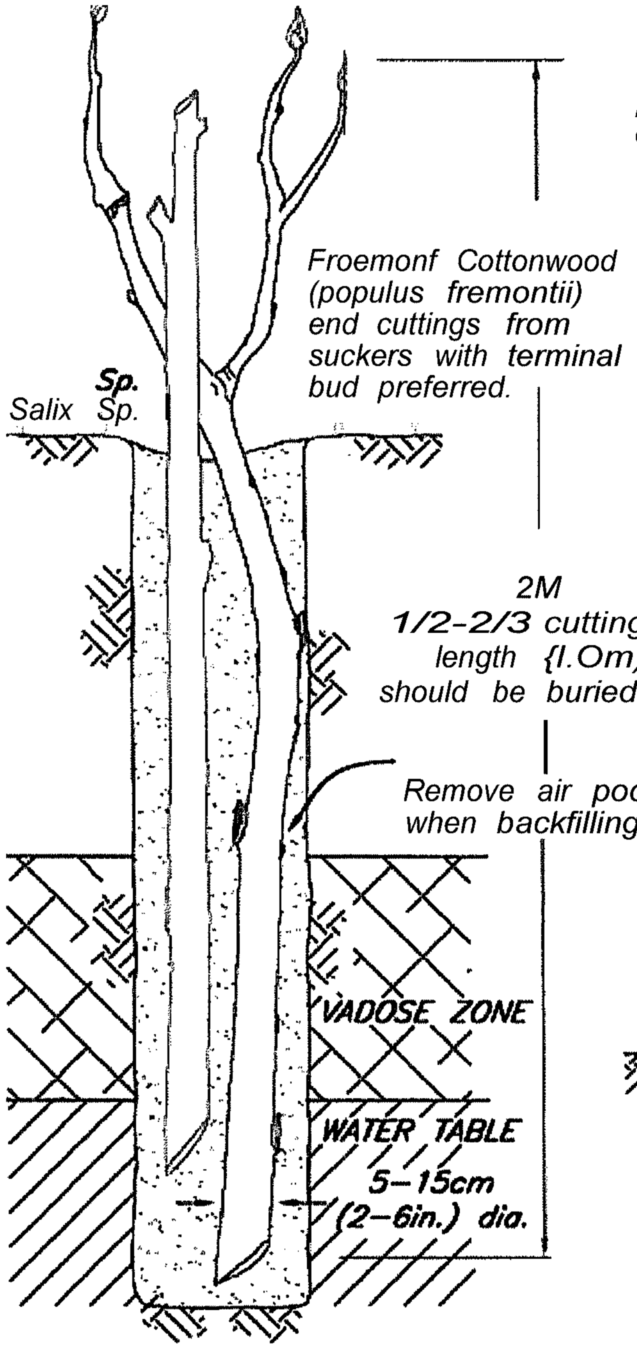
POLE PLANTING

Construction Specifications:

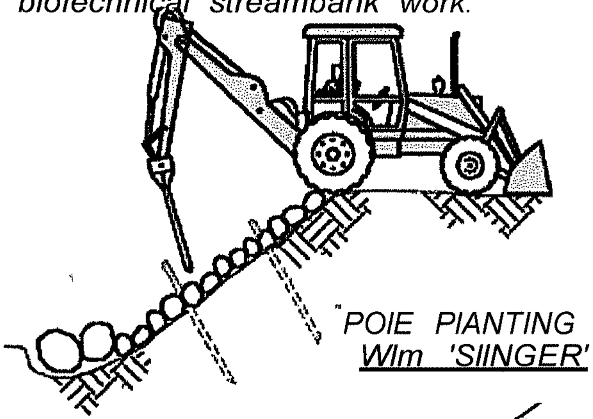
Collect and harvest cuttings (ideally during the dormant season) and then soak the poles for 5 to 7 days. Plant poles into an augered, "punched", or excavated hole. The holes should extend to approximately 1 foot above the water table and through the vadose zone. This depth can be difficult to determine in areas with reservoirs and streams with widely fluctuating seasonal water levels. In this case, ensure that the ends of the poles reach the low waterline at the time of planting if possible.

Pole plantings should ideally be installed during the construction of any structural appurtenances. For instance, plant the poles with the placement of riprap, especially into any trenches excavated for keyways or scour trenches. Another example is to plant the poles during riprap placement such that the poles extend through the riprap and backfill and into contact with the "native" bank The backfill can be placed over and around the poles rather than having to "punch" holes through the riprap, Another method is to plant the poles during gabion construction.

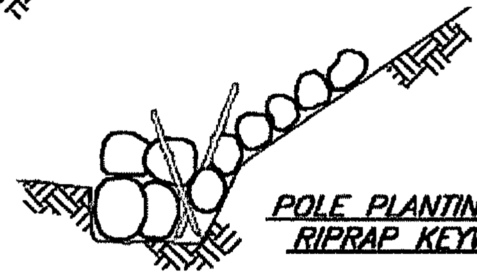
The pole plantings, especially the basal ends, must have good contact with the soil. "Mudding" (filling the hole with water and then adding soil to make a mud slurry) can remove air pockets.


Froemonf Cottonwood (populus fremontii) end cuttings from suckers with terminal bud preferred.
Sp.
Salix Sp.
2M
1/2-2/3 cutting length {l.Om) should be buried.
Remove air pockets when backfilling.
VADOSE ZONE
WATER TABLE
5-15cm (2-6in.) dia.

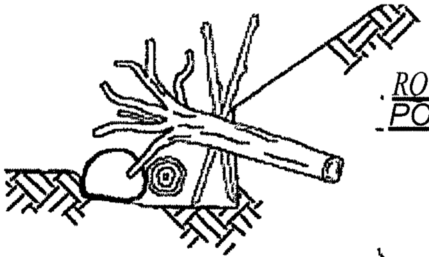
Plant poles deeply during construction of biotechnical streambank work.



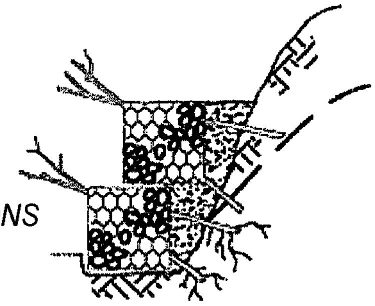
POIE PIANTING Wlm 'SIINGER'



POLE PLANTING IN RIPRAP KEYWAY



ROOTWAf) WITH POLE PLANTING



VEGETATED GABIONS WITH POIES

NOTES:

1. Pole cuttings of willow or cottonwood are longer and have a larger diameter than branch cuttings or live stakes.
2. Larger diameter cuttings have a greater supply of stored energy (stored photosynthesis) than smaller diameter cuttings.
.J. Pole cuttings are better suited for highly erodible areas and sites with fluctuating water levels.
4. The pole cuttings should extend through the vadose zone and into the permanent water table. At least 1/2 to 2/.J of the pole should be below the ground, at least 1.0m (.J ft.), and long enough to emerge above adjacent vegetation.
5. "Muddying"- filling the hole with water and then soil to make a mud slurry can remove air pockets.

POLE PLANTING

McCULLAH

RIPRAP

Construction Specifications:

- Before laying riprap and filler, prepare the subgrade to the required lines and grades shown on the plans. Compact any fill required in the subgrade to a density approximating that of the surrounding undisturbed material.

- Overfill depressions with riprap.

- Remove brush, trees, stumps, and other objectionable materiaL

- Cut the subgrade sufficiently deep so that the finished grade ofthe riprap will be at the elevation of the surrounding area. Channels should be excavated sufficiently to allow placement of the riprap in a manner such that the finished inside dimensions and grade of the riprap meet design specifications.

- Place the sand and gravel filter blanket immediately after the ground foundation is prepared. For gravel, spread filter stone in a uniform layer to the specified depth. Where more than one layer of filter material is used, spread the layers with minimal mixing.

- Place the filter fabric directly on the prepared foundation Overlap the edges by at least 12 inches (OJ m), and space anchor pins every 3 feet (0.9 m) along the overlap. Bury the upper and lower ends of the cloth a minimum of 12 inches (0.3 m) below ground. Take care not to damage the cloth when placing riprap. If damage occurs remove the riprap and repair the sheet by adding another layer of filter material with a minimum overlap of 12 inches (OJ m) around the damaged area. If extensive damage is suspected, remove and replace the entire sheet

- Where large stones are used or machine placement is difficult, a 4 inch (!Olmm) layer of fine gravel or sand may be needed to protect the filter fabric.

- Placement of riprap should follow immediately after placement of the filter. Place riprap so that it forms a dense, well-graded mass of stone with a minimum of voids. The desired distribution of stones throughout the mass may be obtained by selective loading at the quarry and controlled dumping during final placement.

- Place riprap to its full thiclmess in one operation.

- Do not place riprap by dumping through chutes or other methods that cause segregation of stone sizes.

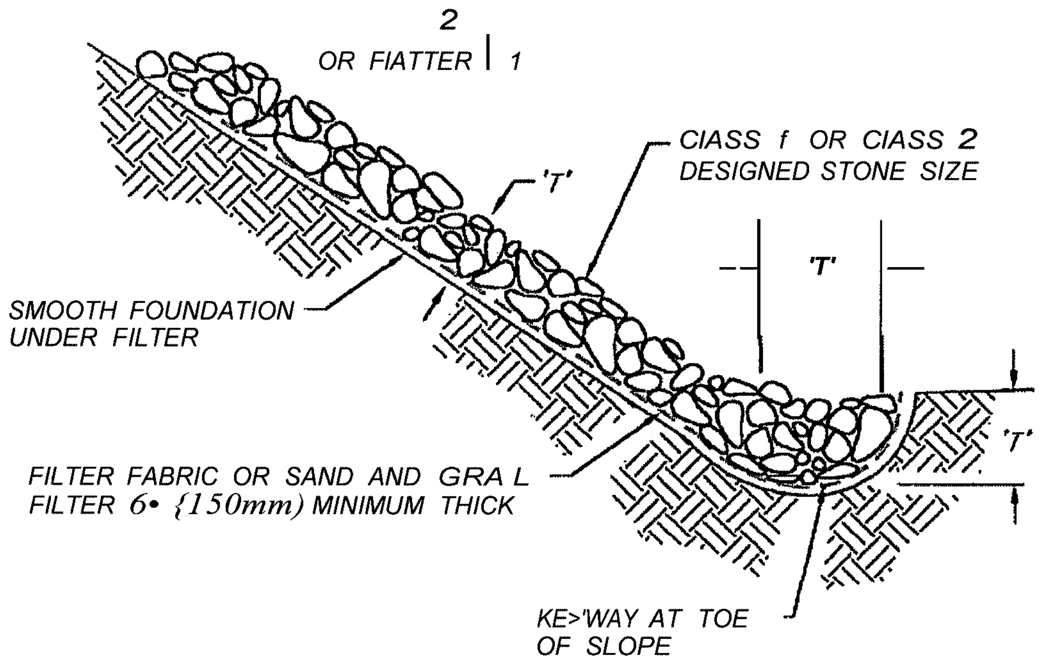
- Take care not to dislodge the underlying base or filter when placing the stones.

- The toe of the riprap slope should be keyed to a stable foundation at its base.

- The toe should be excavated to the depth about 1.5 times the design thiclmess of the riprap and should extend horizontally from the slope.

- The finished slope should be free of pockets of small stone or clusters of large stones. Hand placing may be necessary to achieve the proper distribution of stone sizes to produce a relatively smooth, uniform surface. The finished grade of riprap should be apparent

Inspection and Maintenance: Properly designed and installed riprap requires very little maintenance. Riprap should be inspected periodically for scour or dislodged stones. Control of weed and brush growth may be needed in some locations



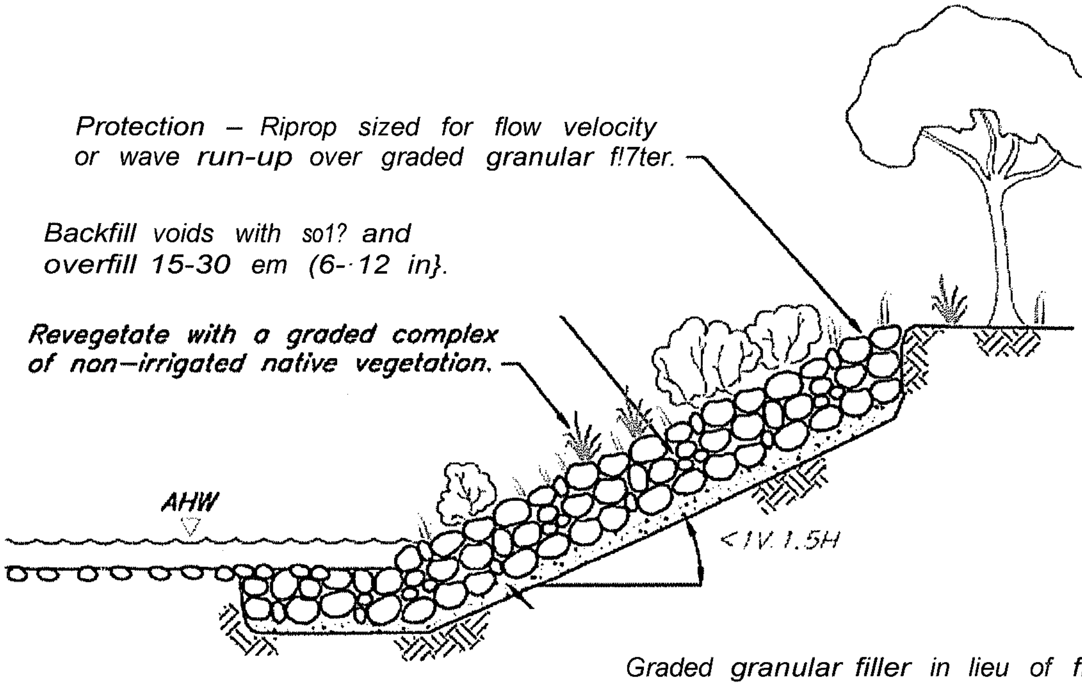
TYPICAL SECTION

NOTE:
'T' = THICKNESS: THICKNESS SHALL BE DETERMINED BY THE ENGINEER.

MINIMUM THICKNESS SHALL BE 1.5x THE MAXIMUM STONE DIAMETER, NEVER LESS THAN 6" (150mm).

RIPRAP PROTECTION

ALE: RIPRAP .



Protection – Riprap sized for flow velocity or wave run-up over graded granular filter.

Backfill voids with soil and overfill 15-30 cm (6-12 in).

Revegetate with a graded complex of non–irrigated native vegetation.

Graded granular filler in lieu of filter fabric to allow root penetration.

NOTES: CLASS 2 PERMEABLE MATERIAL

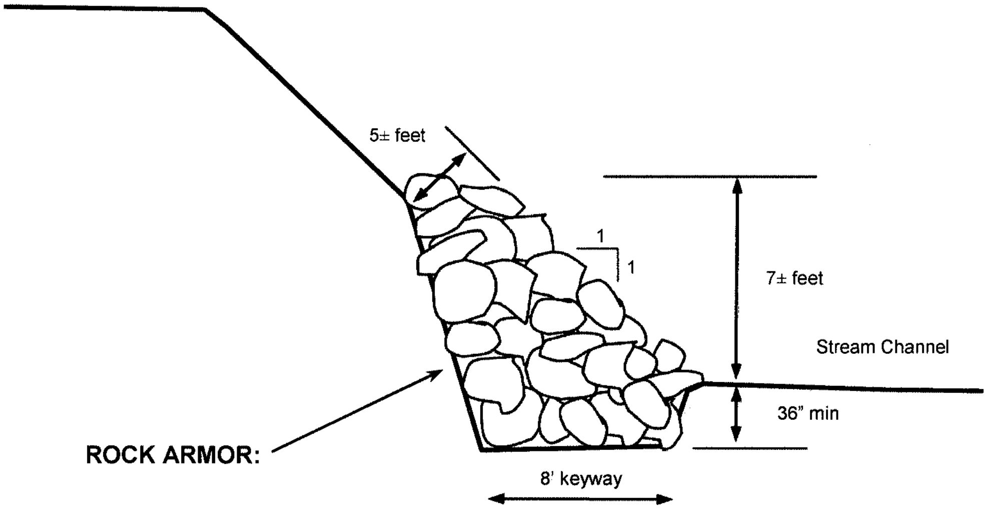
Permeable material for blankets or other subdrainage purposes shall consist of hard, durable, clean sand, gravel or crushed stone and shall be free from organic material, clay balls, or other deleterious substances.

Class 2 permeable material shall have a Durability Index of not less than 40 and a Sand Equivalent value of not less than 75.

SIEJI£$1ZES	PERCENTAGE PASSING
1-Inch	100
3/4-Inch	90-100
3/8-Inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

RIPRAP
W/ SOIL AND GRASS OR GROUND COVER

A U 'WR R



Notes

Keyway

- Rip rap shall be keyed a minimum of 3 feet below channel bottom and into the bank at the upstream and downstream end.
- The base keyway shall be a minimum of 8 feet wide and sloped into the hillside a minimum of 5%
- Clean keyway of loose organic debris and other unsuitable material prior to placing rock
- Remove only the portions of the log jam that extend into the construction area, the remainder of the log jam shall be undisturbed unless otherwise approved b DFG

Rock

- Rip rap shall consist of angular sound durable rock free of fracture or joint plans.
- Rock shall be graded (mix of sizes) with 50% of the rock (D50) greater than 30 inches minimum diameter.

Rock Placement

- Rock shall be carefully placed to optimize strength
- Rock shall be placed a minimum of 2 layers thick (5 feet).
- Rock shall extend 7 vertical feet above the channel bottom and be inclined no stepper than 1:1 slope
- Voids shall be filled with earth and smaller rocks to facilitate vegetation growth between the rocks. Earth may be placed at the time of construction or flushed in after construction if approved by DFG.

Earthwork

- Slope above the riprap revetment structure shall be laid back to a 1:1 of gentler slope

Revegetation

- Bare ground above the rip rap revetment structure shall be planted with redwood sprouts
- Earth fill voids in the rip rap revetment structure shall be planted with redwood, willow or other approved plants
- RPF shall provide planting instructions at the time of operations

Erosion control

- A temporary silt fence shall be installed at the base of the construction area to minimize the amount of sediment that enters the stream
- Exposed soils shall be mulched and covered with approved erosion control blanket or netting.

7E **RIP RAP (Typical)**
NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**RIP RAP REVETMENT TYPICAL SPECIFICATIONS**	**Standard Detail 7E** Date: May 3, 2009

Rootwad Revetment with Vegetated Riprap

Native material revetments are viable alternatives to riprap armoring and gabion type structures. Root wads and logs are constructed to protect the streambank from erosion, provide in-stream and overhead cover for fish. The practice discussed here combines root wads with a layer of stones and/or boulder armoring, generally referred to as riprap revetment. The root wads and riprap are placed along a streambank and will be vegetated with pole planting, brushlayering, and live staking (joint planting).

Conditions Where Practice Applies

The implementations of root wad revetments are beneficial if these type of structures are naturally-occurring in adjacent stream reaches or in similar stream types. Analysis of channel morphology and stream type should be performed to determine if natural material revetments will achieve the desired results.

Vegetated riprap techniques should be considered with project in streams with fishery resources. See Vegetated Riprap. The inclusion of root wads and other large woody debris will enhance the fishery habitat. The root wads are intended to produce scour pools while the overhanging wood and vegetation will provide cover and shade.

Materials

The root wad should have the bole (trunk) attached to allow anchoring into the bank. The length of the bole is dependent on site conditions, however, it should be a 2-m (6 foot) minimum.

For the riprap component, the size and weight is dependant on design velocity or slope stability analysis. A filter layer, either graded aggregate or filter fabric, placed under the riprap will prevent the washout (piping) of fines through the armor layer.

Willow material for brushlayers and pole planting will be required. The length of the cuttings will depend on the depth through the riprap and filter layer to the native soil. Live cuttings can be included and should consist of relatively straight willow branches, 25-40 mm (1-1.5 inches) diameter and long enough to reach beyond the riprap and filter layer and into native ground.

Advantages

By combining boulders, logs and live plant materials to armor a streambank fish habitat is enhanced, in addition to creating a natural looking stabilization structure. Root wad revetments can be used for a wide range of fishery enhancement structures for various stream types. Vegetated rootwads combined with vegetated riprap can protect the streambank, provide in-stream and overhead cover for fish, provide shade, provide detritus and terrestrial insect habitat, look natural, and provide habitat diversity.

Rootwad Revetment with Vegetated Riprap (continued)

Disadvantages

The woody materials will probably not have the durability of other structural components. However, the inclusion of live woody vegetation, along with the accompanying root reinforcement, may make these structures stronger and more durable.

Implementation

Use a backhoe or excavator to set a "footer" log in a trench excavated below the thalweg (lowest point in the channel), running roughly parallel with the bank. A second log with the root wad attached is set on top of the footer log diagonally, forming an "X". The root wad end is set pointing upstream into the flow and the butt end lying downstream 45-60° degrees. The butt end of the root wad should be set in a trench excavated into the bank. Large boulders and willow poles should be used to secure the root wad, especially at the apex. Placement of the willow poles into the excavations will ensure they are deeply embedded and able to contact the water table. Further incorporation of live woody cuttings (brushlayering and pole planting) will enhance the structure.

dOTES:

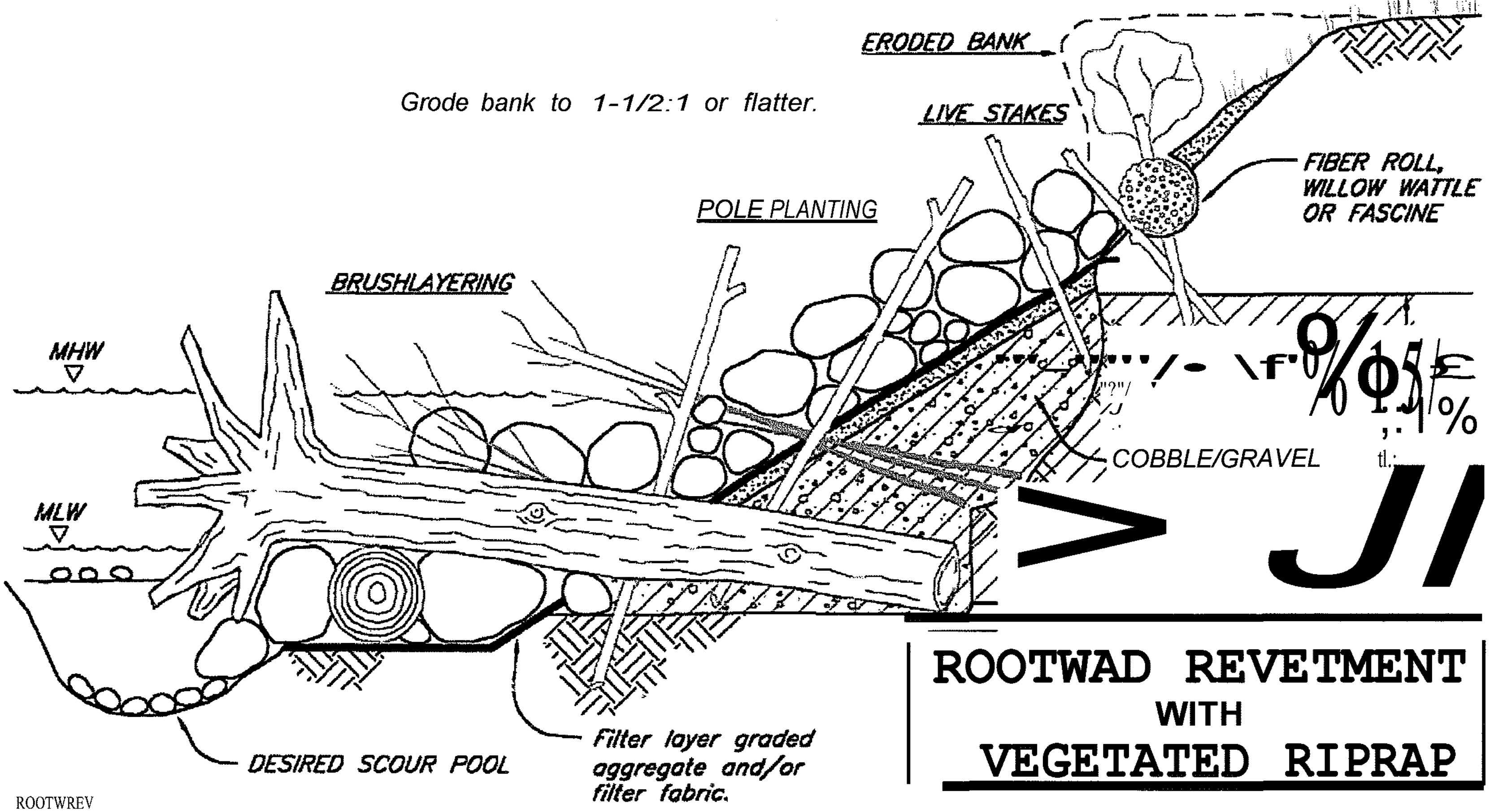
f. Willow pole planting and brushloyen"ng shall be installed during bonk grading and riprop placement to ensure good contact with 'native ground' and soil fill.

2. W!Yiow poles and brush layers shall extend down into expected so11 moisture zones (vadose).

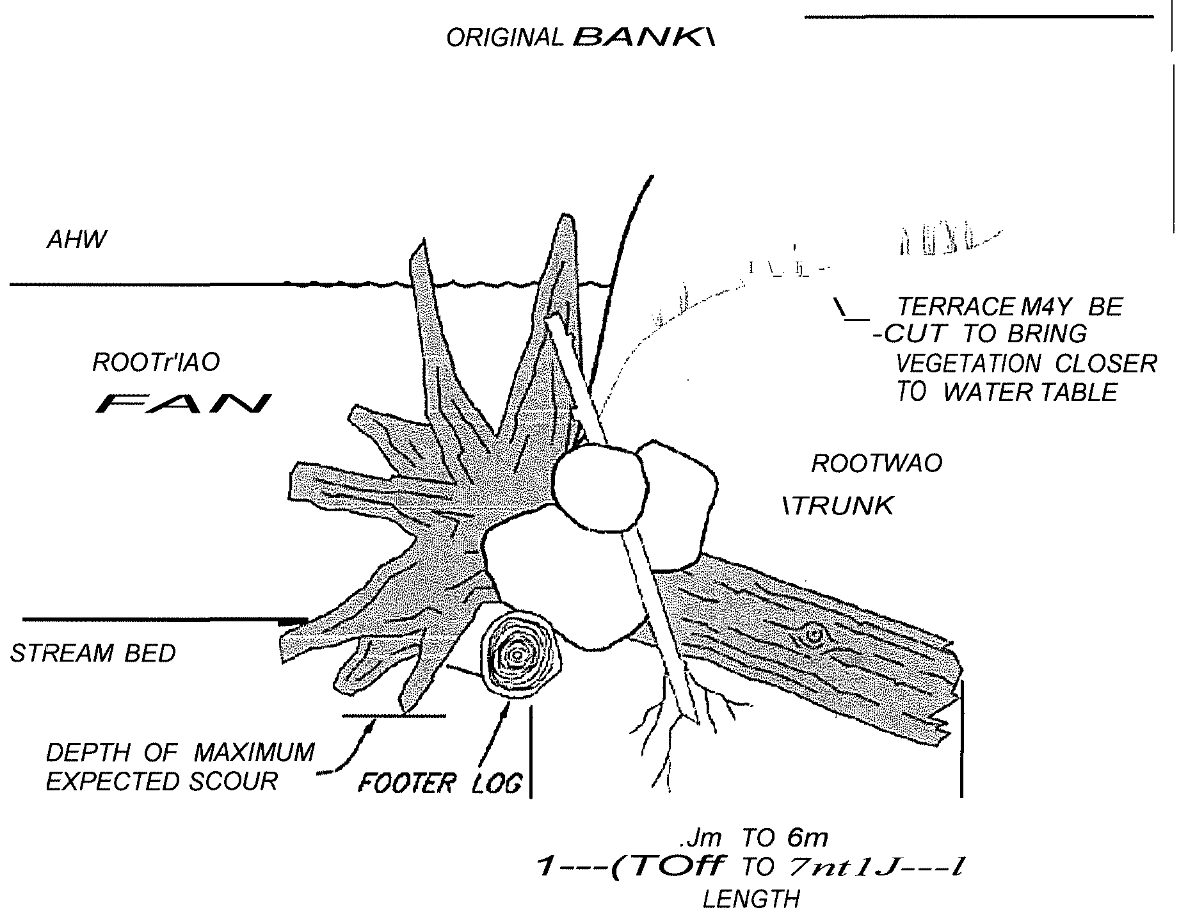
3. Cut small holes or slits in filter fabric as necessaty.

4. Place sa1l fill (cobbles, grovel, soil} around cuttings.

S. Place riprop carefully. do not end dump. Some damage to brush foyers and willow poles is unavoidable and acceptable. Deeply planted wt71ow material Wl7! regenerate.


ERODED BANK
Grode bank to 1-1/2:1 or flatter.
LIVE STAKES
FIBER ROLL, WILLOW WATTLE OR FASCINE
POLE PLANTING
BRUSHLAYERING
MHW
MLW
COBBLE/GRAVEL
DESIRED SCOUR POOL
Filter layer graded aggregate and/or filter fabric.
ROOTWREV

ROOTWAD REVETMENT
WITH
VEGETATED RIPRAP



ROOTWAD REVETMENT
CROSS-SECTION

2004 SALIX

FILE: RRC

Effective Silt Fence Installation

Definition

A silt fence is a temporary sediment barrier consisting of filter fabric entrenched into the soil and attached to supporting posts. Silt fence installed with a trencher or by slicing is the most effective installation method to ensure against common silt fence failures.

Purpose

Silt fence is a sediment control practice. Silt fence is intended to be installed where sediment-laden water can pond, thus allowing the sediment to fall out of suspension and separate from the runoff. It is not intended to be an erosion control practice.

Design Considerations

Typical silt fence specifications were written 25 years ago and have changed little since. Some states have recognized some of the inherent problems, such as inadequate trench depth, and implemented minor changes to improve efficacy. Time and experience has shown that the outdated construction specifications, combined with the improper application and incorrect installation of silt fences, has resulted in it being one of the most ineffective storm water pollution controls in use.

Do not install silt fences across streams, channels, or drainage ways. Silt fences cannot"filter" the volumes generated by channel flows. When installed across a concentrated flow path, undercutting or "end cutting" of the fence often occurs. Silt fences should not be designed to impound sediment or water more than 18 inches (0.5 m) high.

Construction Specifications

Silt fences have a useful life of one season. Their principal mode of action is to slow and pond the water and allow soil particles to settle. Silt fences are not designed to withstand high heads of water, and therefore should be located where only shallow pools can form. Their use is limited to situations in which sheet or overland flows are expected.

- Install silt fence material into a trench, 4" wide and at least 6" deep, with vertical sides. A preferred installation technique involves static slicing with an implement such as the "Tommy Silt Fence Machine" or equivalent. The soil should be sliced and the fabric mechanically installed into the soil.
- The trench must be backfilled and compacted.
- Install silt fences with 'smiles' or J-hooks to reduce the drainage area that any segment will impound

Effective Silt Fence Installation (continued)

- Silt fences placed at the toe of a slope shall be set at least 6 feet (1.8 m) from the toe in order to increase ponding volume.
- The soil should be sliced and the fabric mechanically installed into the soil.
- The height of a silt fence shall not exceed 36 inches (0.9 m). Storage height and ponding height shall never exceed 18 inches (0.5 m).
- The ends of the fence should be turned uphill.
- Steel support posts should be utilized, properly spaced and driven into compacted soil. Place the posts on the downstream side of the fabric/
- Post spacing shall not exceed 6 feet (1.8 m).
- The filter fabric is wire-tied directly to the posts with three diagonal ties. Filter fabric shall not be stapled to existing trees.

Inspection and Maintenance

- Inspect fence for proper installation and compaction by pulling up on the fence while kicking the toe of the fabric. If the fence comes out of the ground, do not "accept" the installation.
- If there are long, linear runs of silt fence without J-hooks or "smiles", do not "accept" the installation.
- Sediment shall be cleaned from behind the fence when it reaches 50% of the designed impoundment height (9 inch (0.2 m).

- Silt fences and filter barriers shall be inspected weekly after each significant storm (1 inch (25.4 mm) in 24 hour). Any required repairs shall be made immediately.
- Sediment should be removed when it reaches 1/3 height of the fence or 9 inches (0.3 m) maximum.
- The removed sediment shall conform with the existing grade and be vegetated or otherwise stabilized.
- Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized and any sediment stored behind the silt fence has been removed.

EFFECTIVE SILT FENCE INSTALLATION WITH SMILES

Construction Specifications:

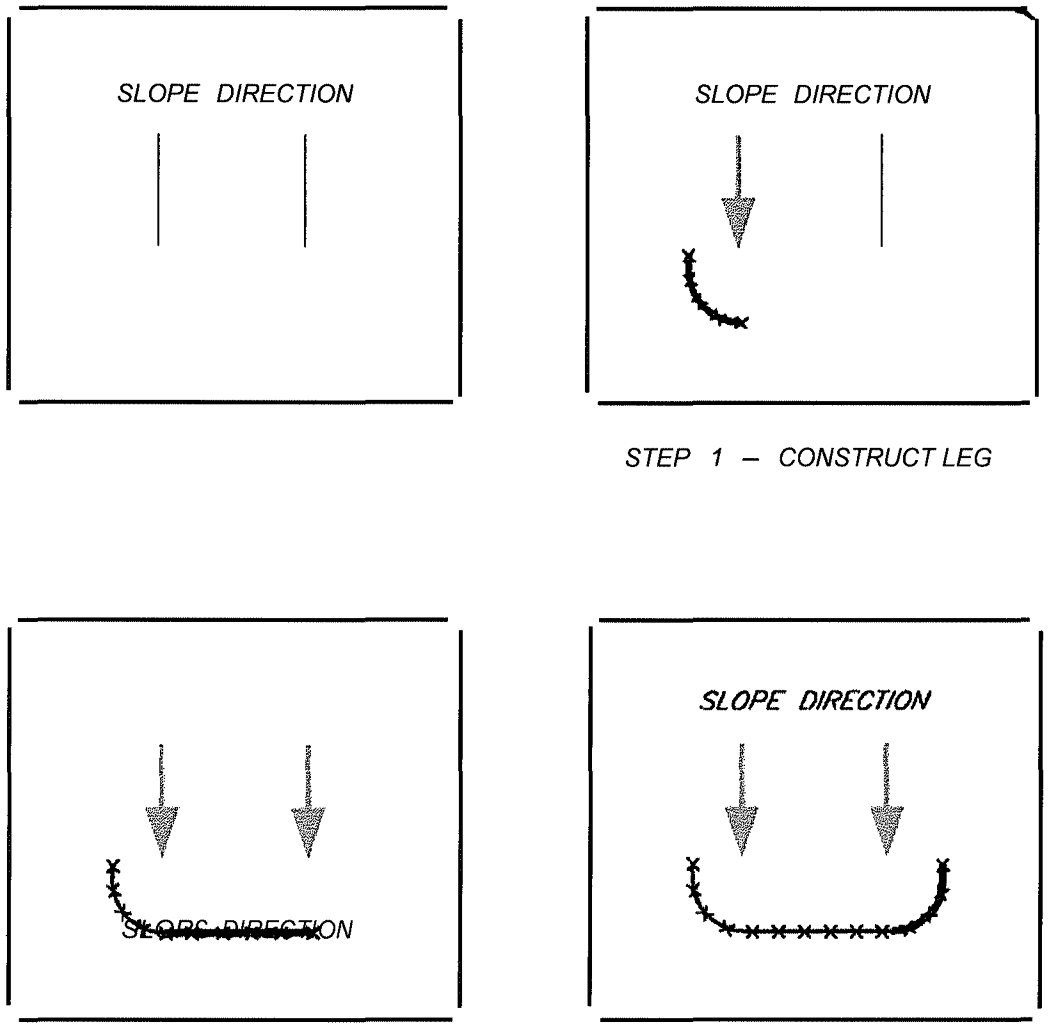
Typical silt fence specifications were written 25 years ago and have changed little since. Some states have recognized some of the inherent problems, such as inadequate trench depth, and implemented minor changes to improve efficacy. The 25 year-old specifications, referred to as the trenching method, have never been tested for efficacy and proven worthwhile. A trencher was simply the only piece of equipment available at the time capable of securing the fabric into the soil, regardless of efficacy

Today, many contractors just open a furrow with a blade and backfill onto the fabric with the crumbs. Loose soil, both from the trencher or the blade, absorbs water quickly and becomes saturated, easily washing out under the fabric.

- The soil should be sliced and the fabric mechanically installed into the soil
- The height of a silt fence shall not exceed 36 inches (0.9 m). Storage height and pending height shall never exceed 18 inches (0 5 m).
- To minimize erosion, install silt fence at the head of a slope to slow velocity and to create a large storage area.
- The fence line shall follow the contour as closely as possible.
- The ends of the fence should be turned uphill.
- Steel support posts should be utilized, properly spaced and driven into compacted soil
- Post spacing shall not exceed 6 feet (1.8 m).
- The filter fabric is stapled or wired directly to the posts. Filter fabric shall not be stapled to existing trees
- Fabric should be attached to the posts with three diagonal ties
- Silt fences placed at the toe of a slope shall be set at least 6 feet (1.8 m) from the toe in order to increase pending volume.

Inspection and Maintenance:

- Silt fences and filter barriers shall be inspected weekly after each significant storm (1 inch (25.4 mm) in 24 hours. Any required repairs shall be made immediately.
- Sediment should be removed when it reaches 1/3 height of the fence or 9 inches (0.3 m) **maximum.**
- The removed sediment shall conform to the existing grade and be vegetated or otherwise stabilized.
- Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized and any sediment stored behind the silt fence has been removed.



STEP 1 – CONSTRUCT LEG

STEP 2 – CONSTRUCT DAM

STEP 3 -- CONSTRUCT LEG 2

INSTALLATION WITH J-HOOKS OR 'SMILES' INCREASE SILT FENCE EFFICIENCY.

2001 JOHN McCULLAH

SILT FENCE
TYPICAL PLACEMENT-ONE SLOPE

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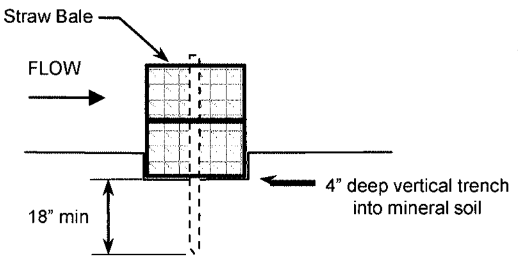
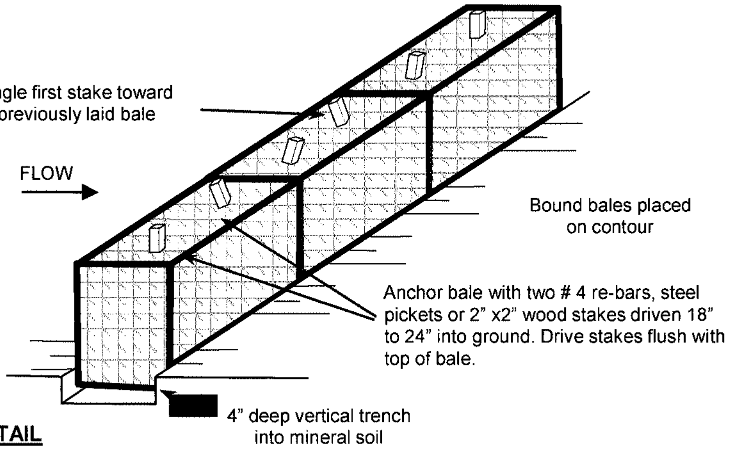


BEDDING DETAILS


Angle first stake toward previously laid bale
FLOW
Bound bales placed on contour
Anchor bale with two # 4 re-bars, steel pickets or 2” x2” wood stakes driven 18” to 24” into ground. Drive stakes flush with top of bale.
4” deep vertical trench into mineral soil

ANCHOR DETAIL

NOTES:

1. Bales shall be placed at contour locations as specified for slope erosion control
2. Bales shall be placed in ditches at designated locations for sediment reduction as specified.
3. Each bale shall be imbedded a minimum of 4” \.
4. Each bale shall be securely anchored in placed by either two # 4 re-bars, steel pickets or 2” x 2” wood stakes driven through the bales. The first stake in each bale shall be driven at an angle to force the bales together.
5. For bales placed on slope, stakes shall be driven a minimum of 18” into firm soils. For bales placed in inside ditches, stakes shall be driven a minimum of 6” into firm native soils.
6. Inspection shall be frequent and repair replacement shall be made promptly as needed
7. Bales shall be removed as directed

8C **STRAW SILT FENCE (Typical)**
NTS

TIMOTHY C. BEST, CEG
ENGINEERING GEOLOGY AND HYDROLOGY
1002 Columbia Street, Santa Cruz, CA 95060
(831) 425-5832 (831) 425 5830 fax.

STRAW SILT FENCE
TYPICAL SPECIFICATIONS

Standard Detail 8C

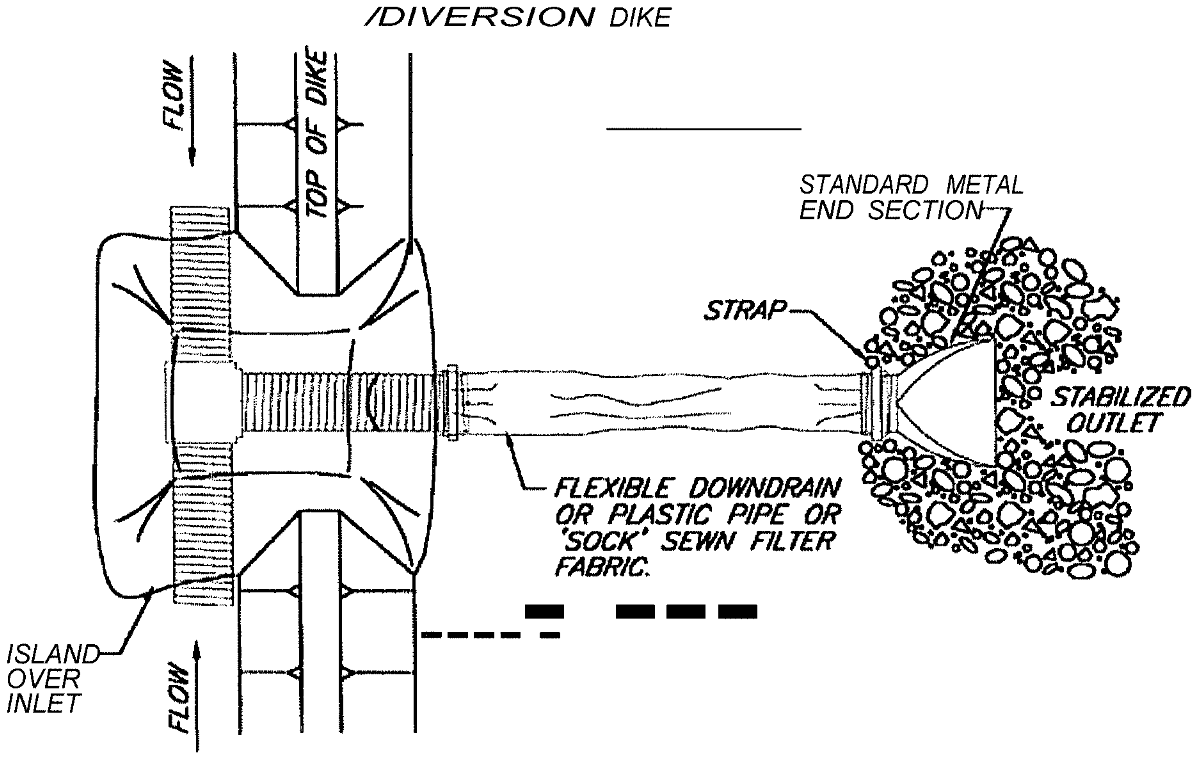
Date: May 3, 2009

SLOPE DRAIN

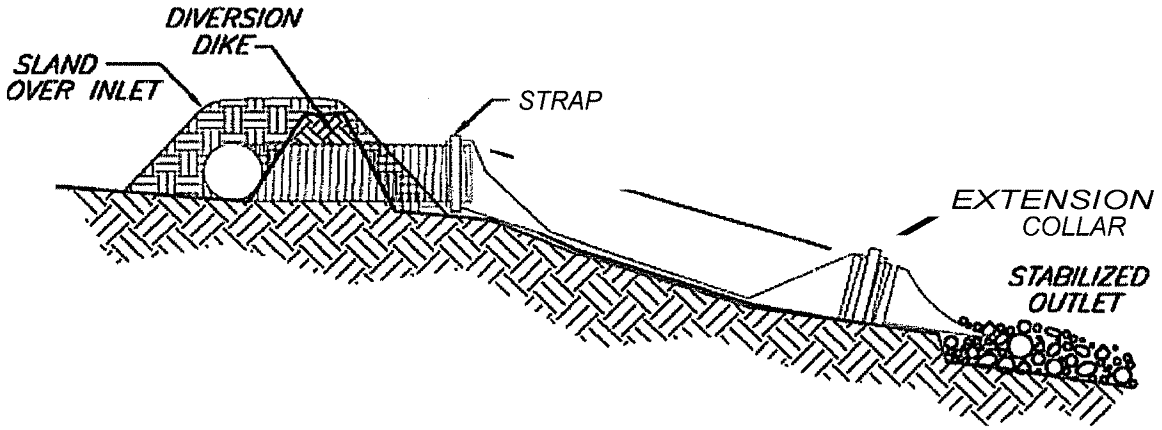
Construction Specifications: A common failure of slope drains is caused by water saturating the soil and seeping along the pipe, Proper backfilling around and under the pipe haunches with stable soil material and hand compacting in 6 inch (.2m) lifts to achieve firm contact between the pipe and the soil at all points will reduce this type of failure,

- Place slope drains on undisturbed soil or well-compacted fill at locations and elevations shown on the plans,
- Slightly slope the section of pipe under the dike toward its outlet
- Compact the soil under and around the entrance section in lifts not to exceed 6 inches,
- Ensure that fill over the drain at the top of the slope has a minimum depth of 1 5 feet (0 5 m) and a minimum top width of 4 feet (L2 m). The sides should have a 3:1 slope,,
- Ensure that all slope drain connections are watertight
- Ensure that all fill material is well-compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 feet (3.1 m) apart
- Extend the drain beyond the toe of the slope and adequately protect the outlet from erosion.
- Make the settled, compacted dike ridge no Jess than I foot *(03* m) higher than the top of the pipe inlet
- Immediately stabilize all disturbed areas following construction.

Maintenance: Inspect the slope drain and supporting diversions after every significant rainfall and promptly make necessary repairs, When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately


/DIVERSION DIKE
FLOW
TOP OF DIKE
STANDARD METAL END SECTION
STRAP
STABILIZED OUTLET
FLEXIBLE DOWNDRAIN OR PLASTIC PIPE OR 'SOCK' SEWN FILTER FABRIC.
ISLAND OVER INLET
FLOW

PLAN VIEW



SECTION

SLOPE DRAIN

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FILE: SLOPEDRN

Straw Rolls

Straw rolls are manufactured from straw that is wrapped in black plastic netting. They are approximately 200 mm (8 inches) in diameter by 8-9 m (25-30 feet) long. Rolls are placed and staked along the contour of newly constructed or disturbed slopes, in shallow trenches.

Conditions Where Practice Applies

Sites appropriate for straw rolls are slopes susceptible to sheet and rill erosion, slopes producing dry ravel, slopes susceptible to freeze/thaw activity, or slopes difficult to vegetate because of soil movement. Straw rolls are not intended for use in concentrated flow situations. Straw rolls will last an average of one to two years. This is an important factor when planning the optimum length of time the slope will need mechanical stabilization. Straw rolls can be staked with live stakes if site conditions warrant. The moisture retained by the straw roll will encourage cutting establishment.

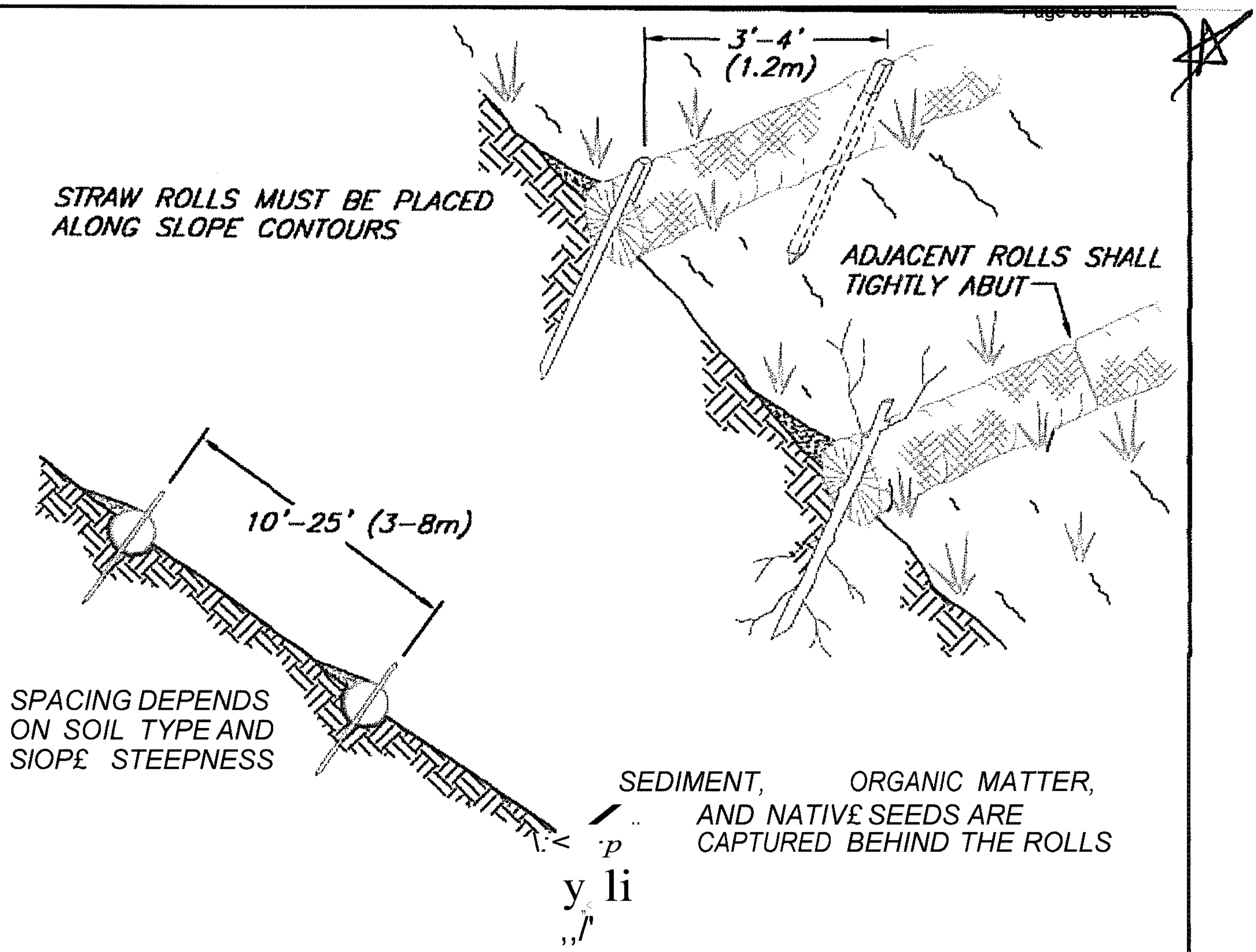
Advantages

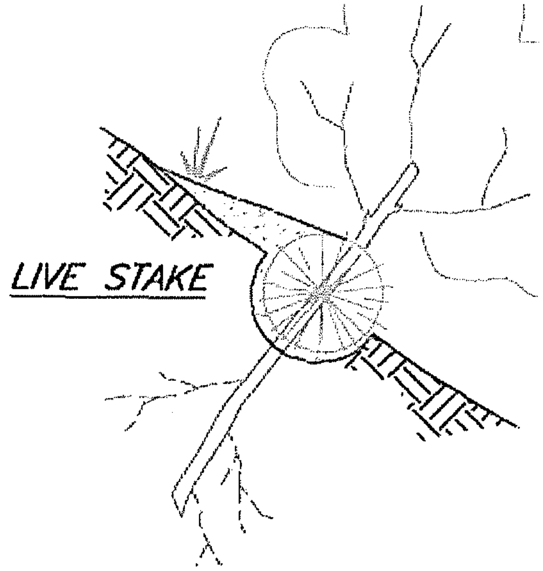
Straw rolls are a relatively low-cost solution to sheet and rill erosion problems. They better suited than silt fences or straw bales for placement on steep slopes. Straw Rolls help establish native vegetation as rolls store moisture for vegetation planted immediately upslope. The moisture retention can help in the establishment of willows from live cuttings. The plastic netting will eventually photodegrade, eliminating the need for retrieval of materials after the straw has broken down. The straw will become incorporated into the soil with time, adding organic material to the soil and retaining moisture for vegetation.

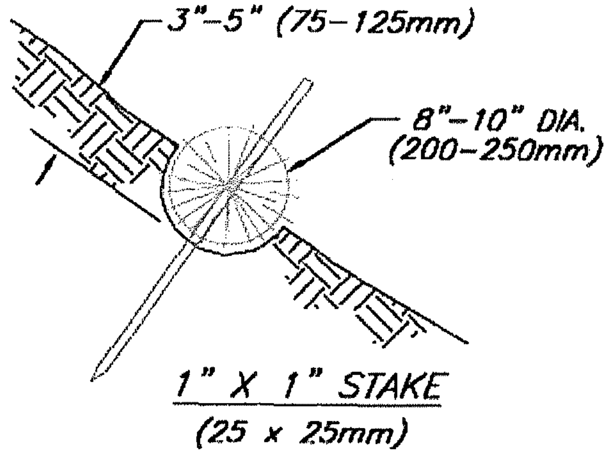
Implementation

Prepare the slope before the installation procedure is started. Shallow gullies should be smoothed as work progresses. Dig small trenches across the slope on contour to place the rolls in. The trench should be deep enough to accommodate half the thickness of the roll. When the soil is loose and uncompacted, the trench should be deep enough to bury the roll 2/3 of its thickness because the ground will settle.

Start building trenches and install rolls from the bottom of the slope and work up. Construct trenches at contour intervals of 3-12 feet (1-4 m) apart depending on steepness of slope. The steeper the slope, the closer together the trenches. Make sure no gaps exist between the soil and the straw wattle. Use a straight bar to drive holes through the wattle and into the soil for the willow or wooden stakes. Drive the stake through prepared hole into the soil. Leave only 25-50 mm (1-2 inches) of stake exposed above roll. Install stakes at least every 1.2 m (4 feet) apart. Use straight willow stakes, 20-mm (3/4 inch) diameter in addition to wooden stakes.


3'-4'
(1.2m)
STRAW ROLLS MUST BE PLACED ALONG SLOPE CONTOURS
ADJACENT ROLLS SHALL TIGHTLY ABUT
10'-25' (3-8m)
SPACING DEPENDS ON SOIL TYPE AND SLOPE STEEPNESS
SEDIMENT, ORGANIC MATTER, AND NATIVE SEEDS ARE CAPTURED BEHIND THE ROLLS
y li





NOT TO SCALE

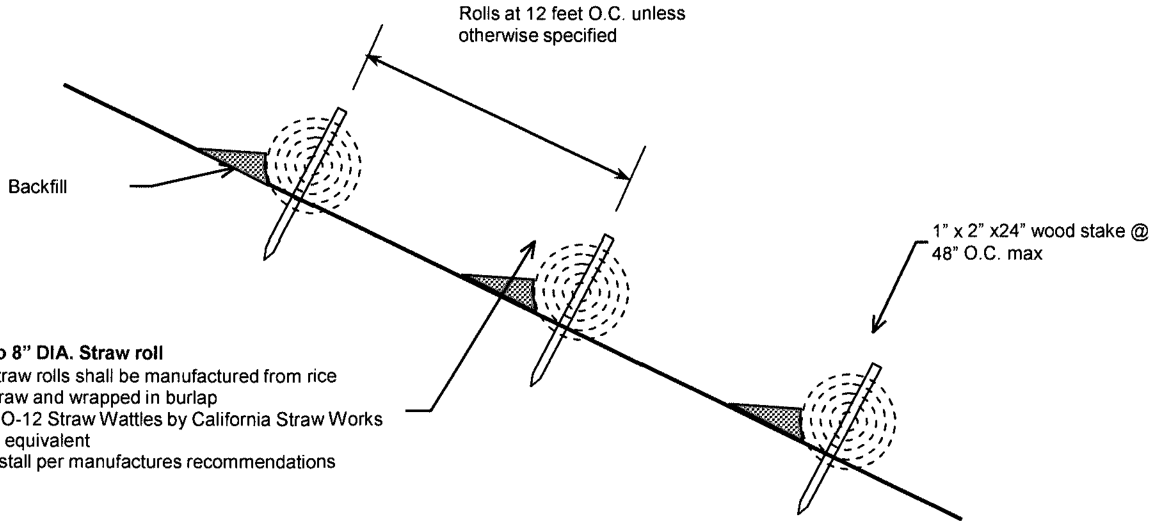
NOTE:

1. STRAW ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3"-5" (75-125mm) DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL

STRAW ROLLS

FILE: STRWROLL

Date of last revision


Rolls at 12 feet O.C. unless otherwise specified
Backfill
1" x 2" x24" wood stake @ 48" O.C. max

6" to 8" DIA. Straw roll
- Straw rolls shall be manufactured from rice straw and wrapped in burlap
- BIO-12 Straw Wattles by California Straw Works or equivalent
- Install per manufactures recommendations

NOTE:
- Location
  - Install at base of disturbed areas and at outlets of new or reconstructed reverse grades/rolling dips unless otherwise specific
  - Rolls to extend across entire width of disturbed area unless otherwise specified or directed.
- Placement
  - Install per manufactures recommendations
  - Rolls to be placed on slope contour
  - Adjacent rolls to overlap; turn ends of rolls up
  - Runoff must not be allowed to run under or around the roll

8B **STRAW ROLL (Typical)**
NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**STRAW ROLL PLACEMENT** **TYPICAL SPECIFICATIONS**	**Standard Detail 8B** Date: May 3, 2009

STRUCTURAL STREAMBANK STABILIZATION

Construction Specifications:

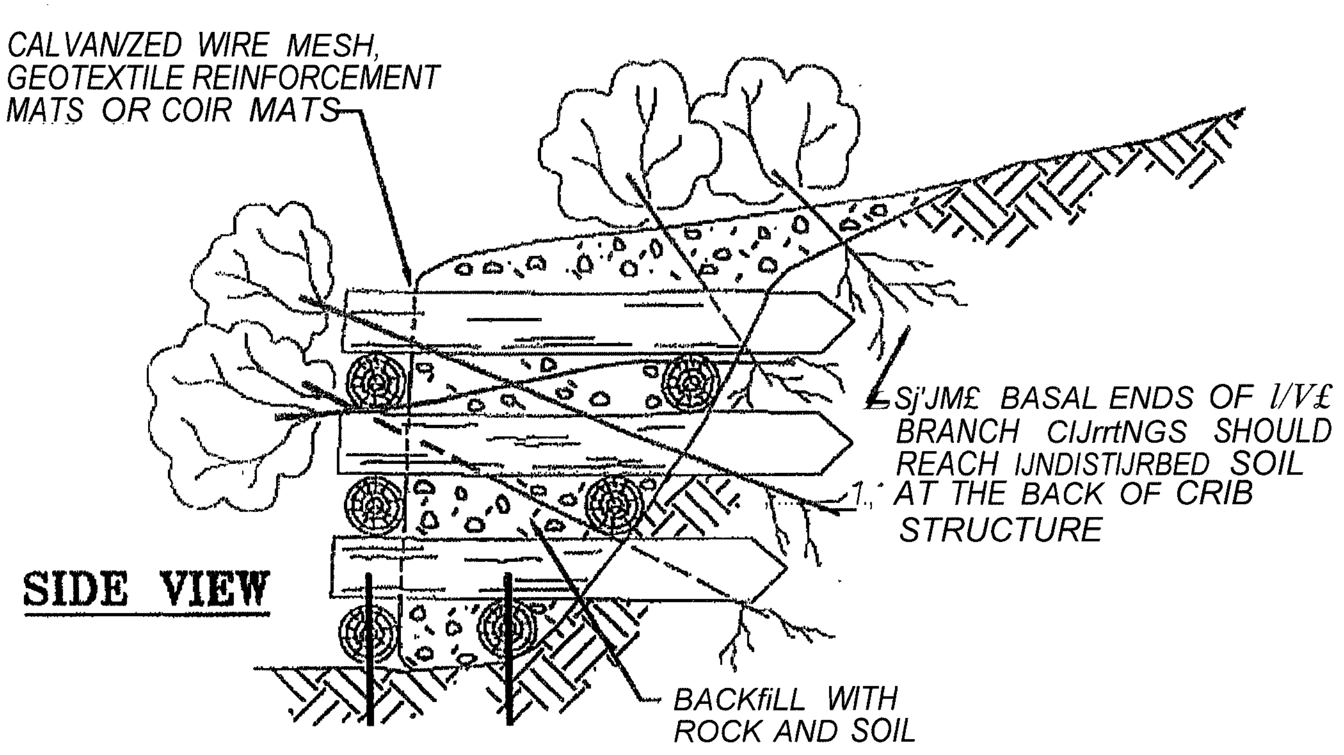
Riprap: Riprap is the most commonly used structural material for stabilizing streambanks. When possible, slope banks to 2:1 or flatter, and place a gravel filter or filter fabric on the smoothed slopes before installing riprap. Place the toe of the riprap at least 1 foot (0.3 m) below the stream channel bottom or below the anticipated depth of channel degradation. Where necessary, riprap the entire stream cross section. It is important to extend the upstream and downstream edges of riprap well into the bank and bottom. Extend riprap sections the entire length between well-stabilized points of the stream channel.

Deflectors: Deflectors are structural barriers, in the form of groins or jetties which project into the stream to divert flow away from eroding streambank sections. Stone and rock deflectors, used as instream structures, may also be useful for environmental and habitat enhancement..

- Live willow {or other riparian species) staking may be incorporated into the construction of the rock deflectors.
- The deflectors should be shaped in a 30-60-90 degree triangle with the 30 degree angle upstream and against the bank.
- The deflectors are generally spaced 3-5 times the length of its groin.
- Single wing deflectors should extend 114 to 112 of the way across the stream.
- Double wing deflectors will extend no more than 1/4 of the way across the stream, opposite each other. The narrowest point between deflector will be 1/2 of the stream width.
- In general, the first and last deflectors should be double wing deflectors and the general deflector pattern will alternate between double wing and single wing, unless structures are intended to protect an outer bend. Then non-alternating, consecutive single wings may be required.
- The rock deflector should be constructed with a 1.5 foot (0.5 m) minimum diameter rock Larger channels will require larger rock
- Rock deflector should be keyed into the stream bottom a minimum of 1 foot (0.3 m).
- The top of the rock should extend 1 foot (0.3m) above normal stream flow (near bank) and slope down to a height of 0.5 feet (0.2 m) above stream flow at apex.
- The deflectors should be contiguous with riprap or other streambank protection measures.

Log Cribbing is a retaining structure built of logs to protect streambanks from erosion. Log cribbing is normally built on the outside of stream bends to protect the streambank from the impinging flow of the stream. Log cribbing can have live willow (or other riparian species) stakes be planted between the logs, behind the structure and immediately adjacent to the cribbing.

Inspection and Maintenance: All structures should be maintained in an "as built" condition. Structural damage caused by storm events should be repaired as soon as possible to prevent further damage to the structure or erosion of the streambank


CALVANIZED WIRE MESH, GEOTEXTILE REINFORCEMENT MATS OR COIR MATS
SOME BASAL ENDS OF LIVE BRANCH CUTTINGS SHOULD REACH UNDISTURBED SOIL AT THE BACK OF CRIB STRUCTURE
SIDE VIEW
BACKFILL WITH ROCK AND SOIL

BIND AND/OR SPIKE
LOGS TOGETHER
ANCHOR ROD 3/4" X 6'
(20mm X 2m)

TYPICAL LOG CRIBBING

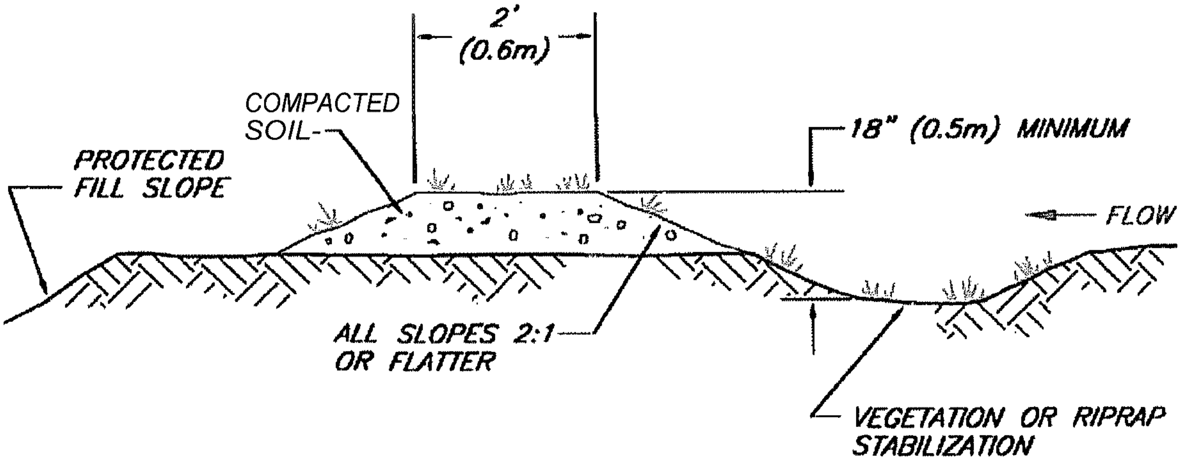
TEMPORARY DIVERSION DIKE

Construction Specifications:

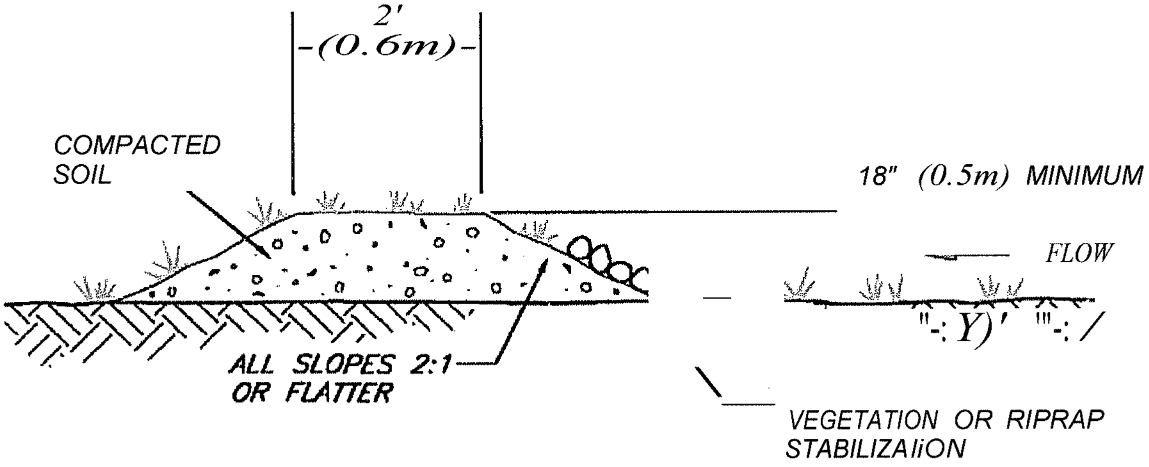
- Temporary diversion dikes must be installed as a first step in the land-disturbing activity and must be functional prior to upslope land disturbance.
- The dike should be adequately compacted to prevent failure.
- Temporary or permanent seeding and mulch shall be applied to the dike immediately following its construction.
- The dike should be located to minimize damages by construction operations and traffic.

Inspection and Maintenance:

- The measure shall be inspected after every storm and repairs made to the dike, flow channel, outlet or sediment trapping facility, as necessary.
- Once every two weeks, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed.
- Diversion Dikes used to trap sediment shall be inspected and cleaned out after every significant storm
- Damages caused by construction traffic or other activity must be repaired before the end of each working day.
- If vegetation has not been established, reseed damaged and sparse areas immediately.



TYPICAL FILL DIVERSION



TYPICAL TEMPORARY DIVERSION DIKE

NOTES:

1. THE CHANNEL BEHIND THE DIKE SHALL HAVE POSITIVE GRADE TO A STABILIZED OUTLET.
2. THE DIKE SHALL BE ADEQUATELY COMPACTED TO PREVENT FAILURE.
3. THE DIKE SHALL BE STABILIZED WITH TEMPORARY OR PERMANENT SEEDING OR RIPRAP.

TEMPORARY DIVERSION DIKE

1996 JOHN McCULLAH

AllilE :li N IK E------------------------ ====================

Vegetated Mechanically Stabilized Earth

Description:

This technique consists of live cut branches (brushlayers) interspersed between lifts of soil wrapped in natural fabric, e.g., coir, or synthetic geotextiles or geogrids. The live brush is placed in a criss-cross or overlapping pattern atop each wrapped soil lift in a manner similar to conventional brushlayering. The fabric wrapping provides the primary reinforcement in a manner similar to that of conventional mechanically-stabilized earth (Koerner, 1998; Mitchell & Villet, 1987). The live, cut branches eventually root and leaf out, providing vegetative cover and secondary reinforcement as well. In some cases, the vegetative treatment may consist of using a coarse netting for the soil wraps and establishing an herbaceous or grass cover by simply hydroseeding through the openings in the fabric.

Purpose:

Vegetated Mechanically Stabilized Earth (VMSE) can be viewed as a union between conventional, mechanically stabilized earth methods that utilize inert, tensile inclusions, and brushlayering, a soil bioengineering technique that utilizes live, cut branches as the tensile soil inclusions. The treatments complement one another. Fabric wraps provide the primary reinforcement and mechanical stabilization, permitting much steeper slopes to be constructed than would be possible with live brushlayers alone. The vegetation shields the fabric against damaging UV radiation and provides visual and habitat benefits.

Conditions Where Practice Applies:

VMSE can be used to stabilize slopes as steep as 1V:0.5H. This technique provides an alternative to vertical retaining structures, e.g., timber pile walls, and to techniques that require slope flattening or bank lay back, which results in excessive right-of-way encroachment at the top of bank. The use of synthetic geotextiles or geogrids provides greater long-term durability and security. The fabric or geotextile wrap also provides additional protection to upper portions of streambanks that are subject to periodic scour or tractive stresses. If either steady, long term seepage or temporary bank return flows after flood events are a problem, the brushlayers act as a drainage layer or conduits that relieve internal pore water pressure, and favorably modify the groundwater flow regime within the slope to minimize slope stability problems.

Complexity:

High. VMSE is relatively complex, because it entails designing, melding together, and constructing two similar yet distinct methods, conventional MSE and live brushlayering. Both techniques are widely used and well understood, however; simultaneous use introduces complexity.

Vegetated Mechanically Stabilized Earth (continued)

Design Guidelines / Typical Drawings:

Many different types of inclusions with various shapes and properties can be used to reinforce and buttress earthen slopes. These inclusions range from imbedded metal strips, geogrids fabricated from polymeric nets, and natural or synthetic geotextiles or fabrics. Earthen slopes, embankments, or structural fills that are stabilized or reinforced with such tensile inclusions are referred to as "mechanically stabilized earth." Shear stresses that develop in the soil matrix are transferred into tensile resistance in the imbedded inclusions via friction along the soil-inclusion interface.

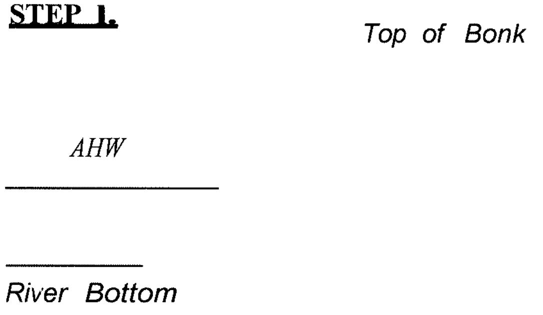
Mechanically stabilized earth retaining structures must satisfy external stability requirements, i.e., have adequate resistance to sliding, overturning, and bearing capacity failure. Internal stability requirements are also important in reinforced earth and mechanically stabilized earth structures. The tensile inclusions or reinforcements in these structures must have a sufficient unit tensile resistance and/or be placed in sufficient numbers to resist breaking in tension. The inclusions must also be sufficiently long and "frictional" enough to resist failure by pullout.

Synthetic geogrids fabricated from high-tensile strength polymeric materials are widely used in reinforced earth embankments and retaining walls. Geogrids tend to have superior pullout resistance compared to geotextile or fabric sheets because of passive resistance mobilized along the transverse elements in a mesh or geogrid. They can be used either in a wrap-around fashion to provide both backfill reinforcement and containment at the front face. This approach permits the insertion of live cuttings or branches between successive lifts of "wrapped soil" as shown schematically in Figure 1.

Live cuttings inserted in the above manner also act as tensile inclusions and help to stabilize a slope, embankment, or structural fill. Live brushlayers behave exactly in this fashion. Gray & Sotir (1992) discuss how brushlayers can be analyzed and their contribution to slope stability determined in a rational, quantitative manner. This contribution could be included as well when inert reinforcements are used in conjunction with live brushlayers such as in VMSE. In this combined approach, however, the contribution to mechanical reinforcement from the live cuttings is simply treated as a bonus, and the design analysis is focused on the fabric or geogrid reinforcements themselves.

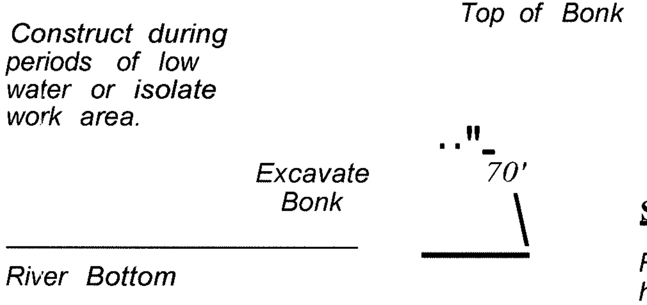
The main considerations in the design of geogrid or geotextile reinforced earthen slopes and embankment fills is the required vertical spacing (d) and total length (L) of the reinforcing layers. The total length (L) is comprised of a length or distance required to reach the expected failure surface in the backfill and an additional length, the effective or imbedment length (L_E), extending beyond the failure surface required to prevent pullout. The reader should consult with a geotechnical engineer as necessary.

STEP 1.

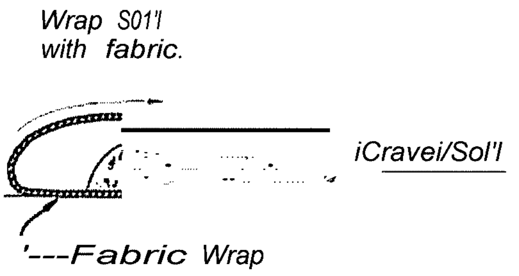


STEP 2.

Construct during periods of low water or isolate work area.

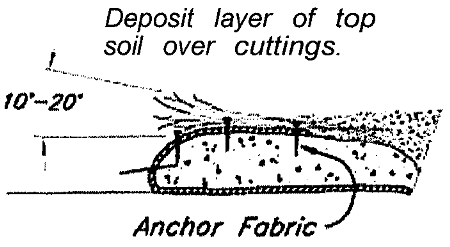


STEP 3.

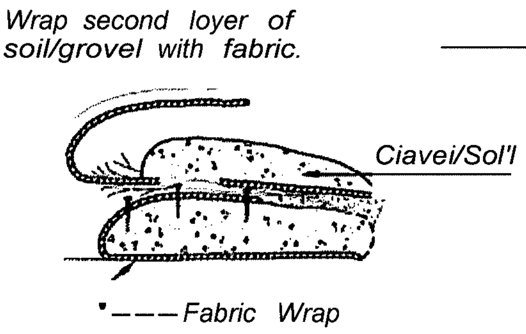


mE...!..

Crisscross layers of dormont cuttings and/or transplants.

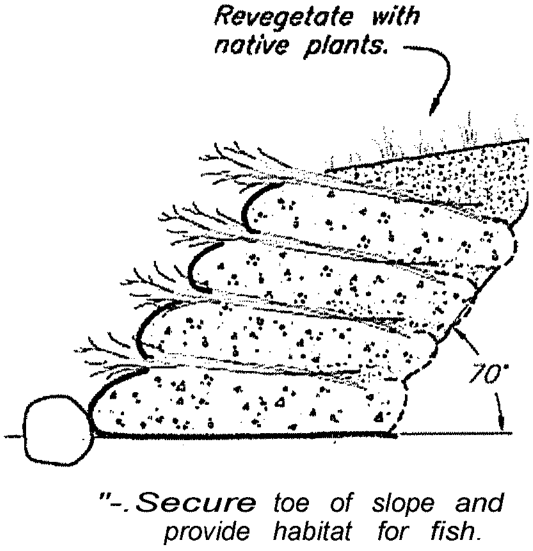


STEP 5.



STEP 6.

Repeat steps 3. 4, 5 unt1'l desired height of bank is reached.


Revegetate with native plants.
70'
"-.Secure toe of slope and provide habitat for fish.

VEGETATED MECHANICALLY STABILIZED EARTH

ŋY -•=• STEP BY STEP

Vegetated Riprap

A layer of stones and/or boulder armoring, generally referred to as riprap revetment, placed along a streambank and designed to be vegetated with pole planting, brushlayering, and live staking (joint planting).

Conditions Where Practice Applies

Rock riprap is the most common and effective form of streambank protection. Rock can settle and conform if some scour should occur. Conventional riprap placement, however, does not increase wildlife habitat nor is it aesthetically pleasing. It often takes many years for riprap to become vegetated if revegetation is not planned in advance and integrated with construction. The agencies whose task it is to ensure fish habitat recognize that the continued use of riprap, gabions, and other inert streambank structures have long-term negative impacts on aquatic habitats.

This practice applies whenever there is a desire to install riprap, which is more attractive and has the potential to enhance, not degrade, fish and wildlife habitat. Additionally, woody vegetation establishment will prevent soil loss (piping) from behind the structures and increase pull out resistance. Vegetated riprap techniques should be considered with projects in streams with fishery resources.

Materials

The main elements are quarry stone or other suitable rock, the size and weight dependant on design velocity or slope stability analysis. A filter layer, either graded aggregate or filter fabric, placed under the riprap will prevent the washout (piping) of fines through the armor layer.

Willow material for brushlayering and pole planting will be required. The length of the cuttings will depend on the depth through the riprap and filter layer to the native soil. Live cuttings can be included and should consist of relatively straight willow branches, 25-40 mm (1-1.5 inches) diameter and long enough to reach beyond the riprap and filter layer and into native ground.

Vegetated Riprap (continued)

Advantages

Studies have shown that the frequency of revetment failure was lower in vegetated revetments than unvegetated sections. The vegetation's roots, particularly the fibrous willow roots, prevent washout of fines and stabilizes the native soil. Vegetation helps to anchor the armor stone to the bank and increases their lift-off resistance. In addition, vegetated revetments provide riparian benefits and wildlife habitat. Vegetated riprap has a more natural appearance and is therefore more aesthetically pleasing. Along streambanks, the vegetation will slow water velocities and encourage deposition and sedimentation. Experience has shown that environmental clearances and permits are easier to obtain if the project has biotechnical, habitat enhancement, elements incorporated into the design.

Disadvantages

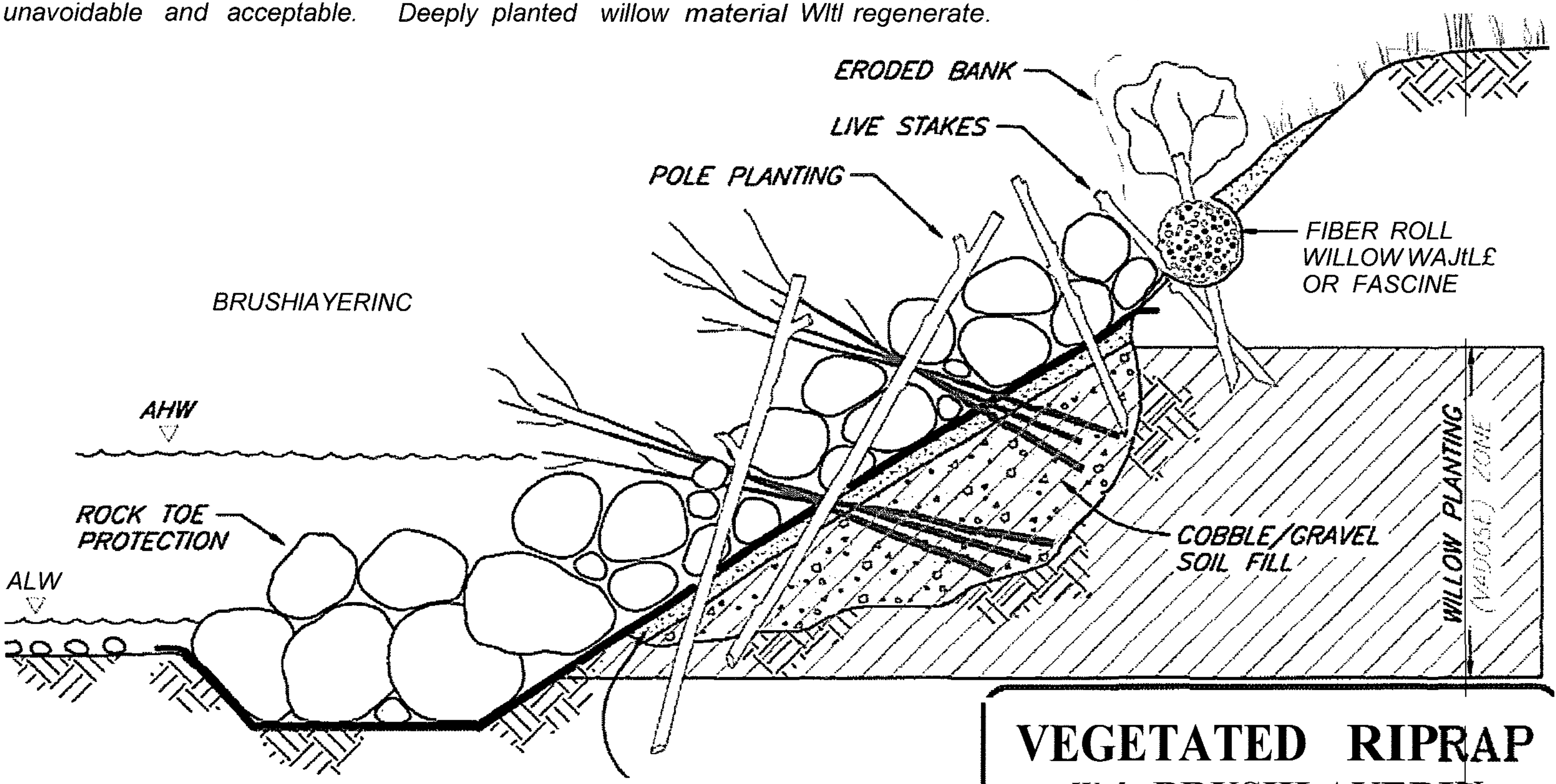
It is sometimes difficult to drive the willow stakes between the rock joints, through filter fabric and into the native soil. The cuttings, brushlayering and pole planting, should be installed while the revetment is being constructed. Installation of the vegetative practices during construction will facilitate the planting but it will requires additional care when placing the rock (end dumping may damage to the cuttings).

Implementation

The branches are inserted during construction in crushed stone or riprap so that the butt ends are imbedded in the soil behind the cover to a depth of 0.3-0.5 m or into the seasonal water table or capillary fringe. The branch tips should protrude for approximately 0.5 m from the stone layer and face at an oblique angle downstream. The lowest branches are below the level of the mean summer flow and well wedged amongst the stone to prevent them from being washed out.

NOTES:

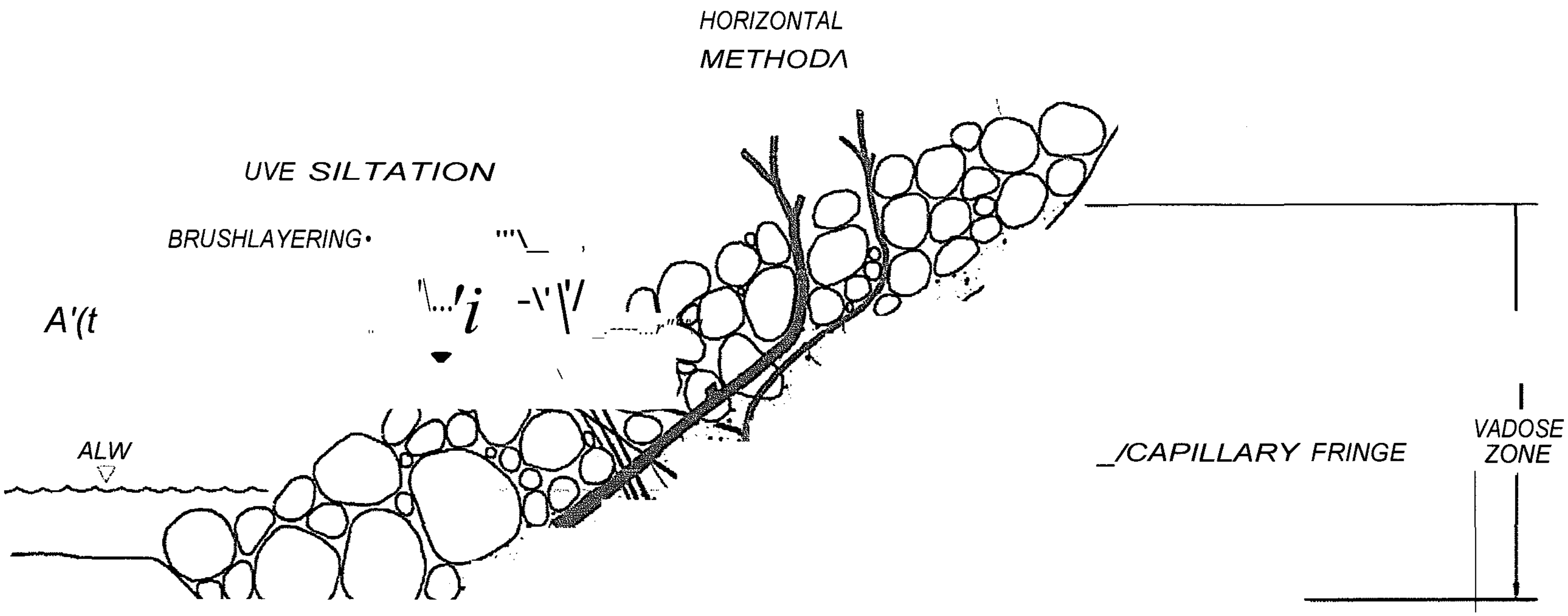
1. Install willow pole planting and brushloyering during bonk grading and riprap placement to ensure good contact with 'native ground' and/or soil fill.
2. Willow poles and brush foyers should extend down info expected so!'l moisture zones (vadose).
3. Cut small holes or slits in fiYter fabric os necessary.
4. Place soil fill (cobbles, grovel, soil} around cuttings.
5. Place riprop carefully. do not end dump. Some damage to brush foyers and w!'llow poles is unavoidable and acceptable. Deeply planted willow material Wltl regenerate.



VEGETATED RIPRAP
W/ BRUSHLAYERIN & POLE PLANTING

NOTES:

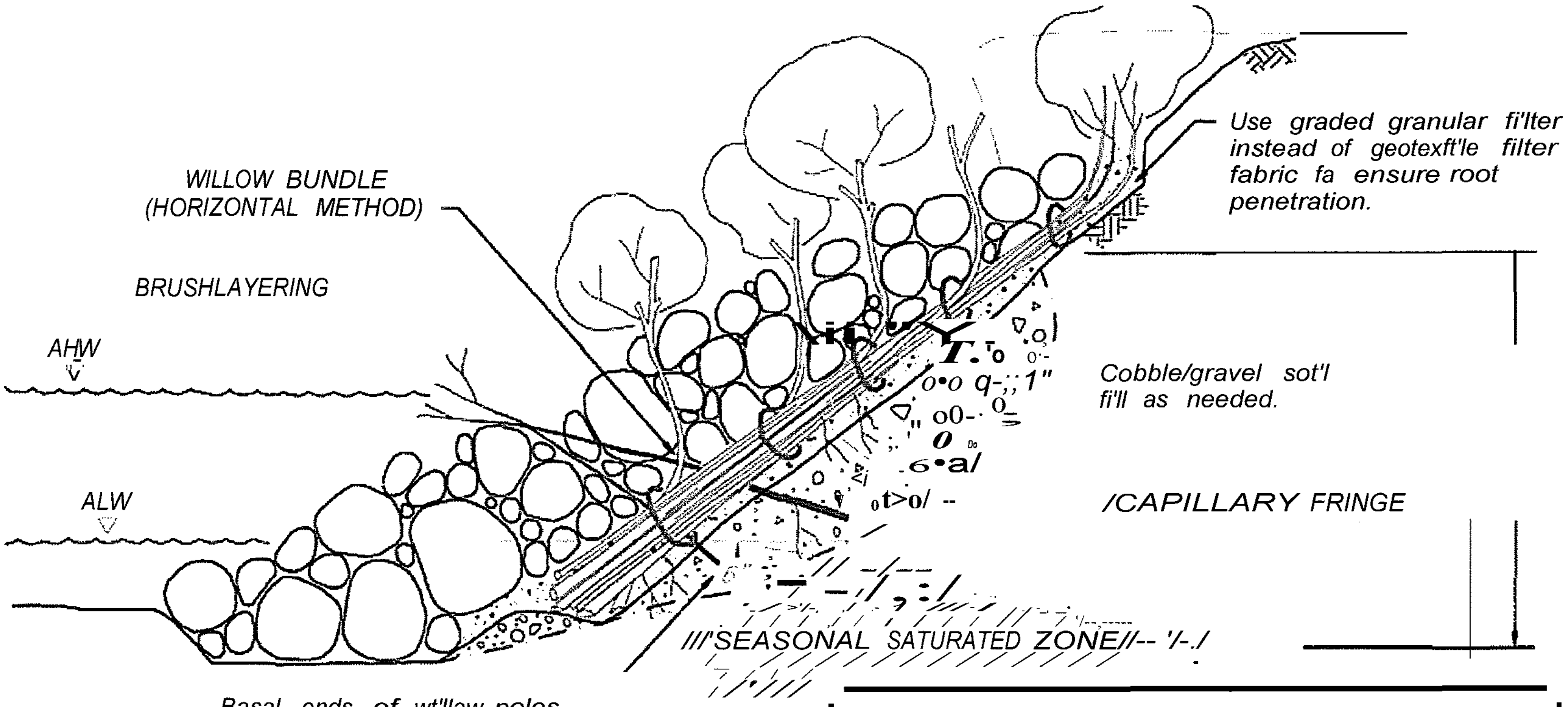
1. Integrate brushlayering, pale planting and live siltation techniques during rock placement to ensure contact with native ground. Laying poles 'horizontally" is an efficient and cast-effective way to maximize rooting.
2. As a general rule, place basal ends of the cuttings 15 em (6") into the capillary fringe or seasonal saturated zane.
3. Graded, granular ftY!er Is preferable to filter fabric to improve root penetration or slip poles through sl!1s cut into fabric.
4. Place soil fill (cobbles, grovel, soil} around cuttings and 'water in' if possible.



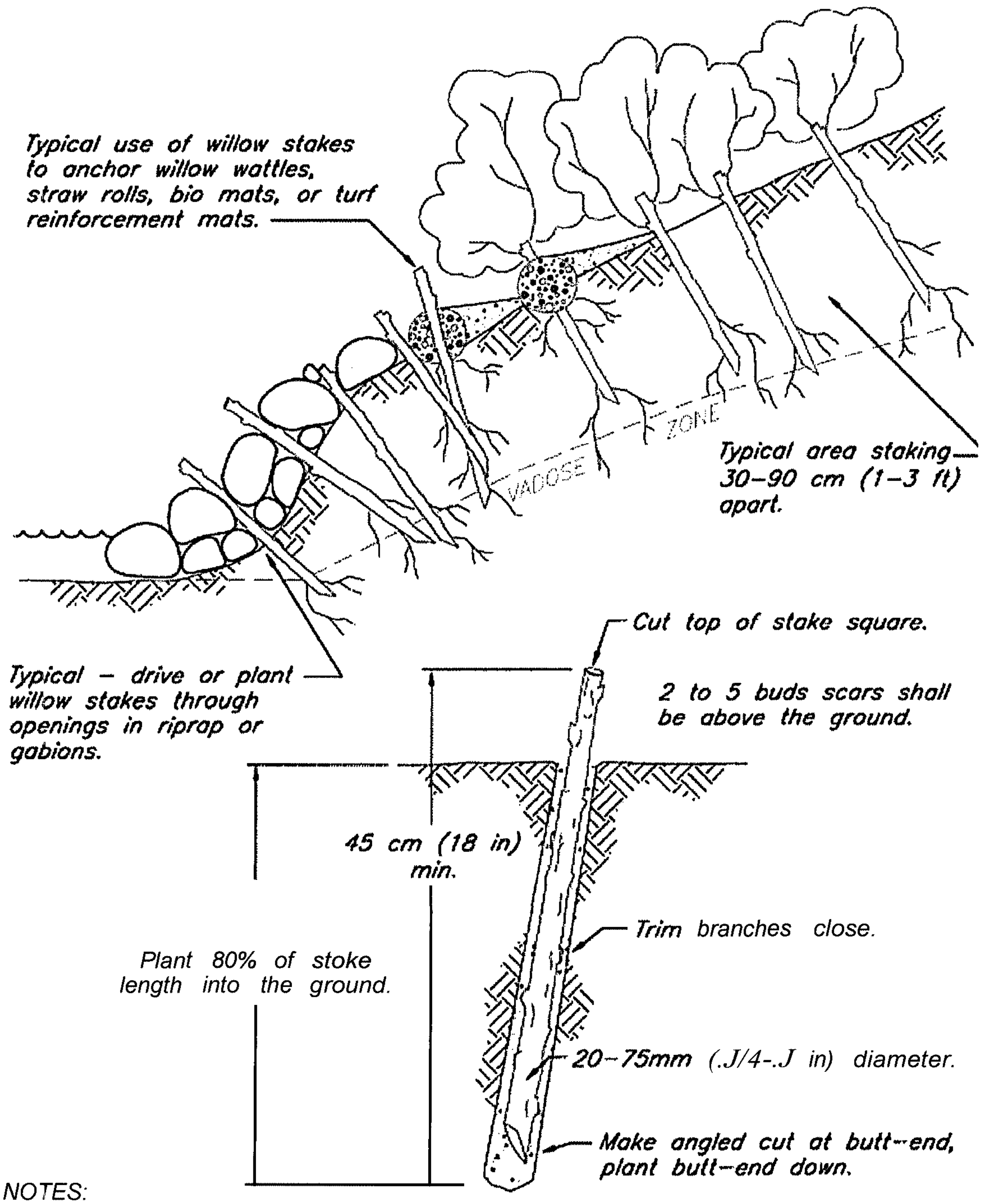
RIPRAP

NOTES:

1. As a general rule, place basal ends of the cuttings 15 em (6") into the copt'llary fringe or seasonal saturated zone.
2. Bend individual poles up through the riprap during placement while ensuring contact of the stem wHh native ground. Laying poles 'horizontally" is an efficient and cost-effective way to maximize rooting.
3. Graded, granular fi'lter is preferable to fi'lter fabric to improve root penetration or slip poles through slits cut into fabric.
4. Place sail fill (cobbles, grovel. soil) around cuttings and 'water in' if possible.


WILLOW BUNDLE
(HORIZONTAL METHOD)
BRUSHLAYERING
AHW
ALW
Use graded granular fi'lter instead of geotexft'le filter fabric fa ensure root penetration.
Cobble/gravel sot'l fi'll as needed.
/CAPILLARY FRINGE
///'SEASONAL SATURATED ZONE//-- '/-./
Basal ends of wt'llaw poles should extend fS em (6") min. into capillary fringe or saturated zone.

VEGETATED RIPRAP
WILLOW BUNDLE METHOD {HORIZONTAL)

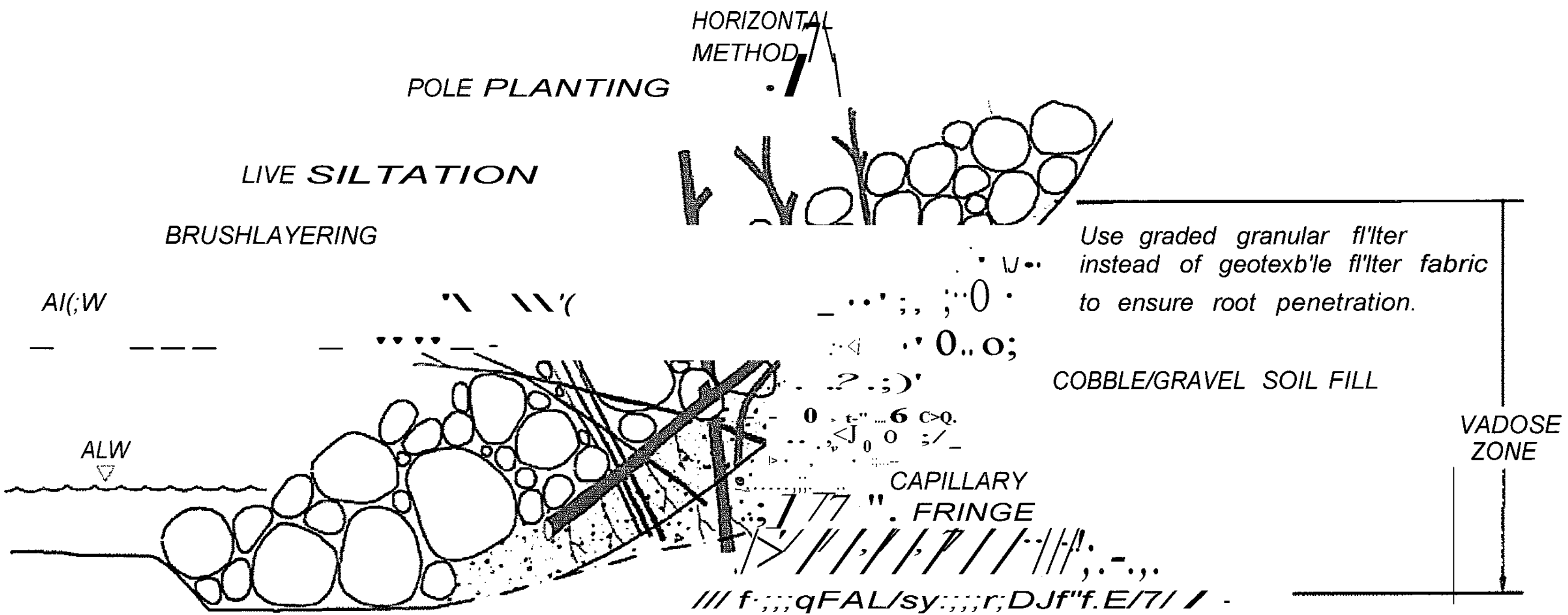

Typical use of willow stakes to anchor willow wattles, straw rolls, bio mats, or turf reinforcement mats.
VADOSE ZONE
Typical area staking— 30–90 cm (1–3 ft) apart.
Typical – drive or plant willow stakes through openings in riprap or gabions.
Cut top of stake square.
2 to 5 buds scars shall be above the ground.
45 cm (18 in) min.
Trim branches close.
Plant 80% of stoke length into the ground.
20–75mm (.J/4-.J in) diameter.
Make angled cut at butt-end, plant butt-end down.

NOTES:
1. Harvest and plant stokes during the dormont season.
2. Use healthy, straight and live wood at least 1 year old.
.J. Make clean cuts and do not damage slakes or split ends during inslollolion, use a pilot bar in firm sol'ls.
4. Soak cuttings for 24 hours (min.) prior to installation.
5. Tamp the soil around the stoke.

VEGETATED RIPRAP
W/ JOINT PLANTING
(LIVE STAKING)

NOTES:

1. Integrate brushlayering, pole planting and live siltation techniques during rock placement to ensure contact with native ground.
2. Plant deeply if possible. Place cuttings deeply into vadose zone, into the capillary fringe or 15 cm (6") into the seasonal saturated zone (water table).
3. Graded, granular filter is preferable to filter fabric to improve root penetration or slip poles through slits cut into fabric.
4. Place soil fill (cobbles, gravel. soil) around cuttings and 'water in' if possible.
5. Place riprap carefully. do not end dump. Some damage to brush layers and willow poles is unavoidable and acceptable. Deeply planted willow material will regenerate.



Use graded granular filter instead of geotextile filter fabric to ensure root penetration.

VEGETATED RIPRAI

DURING CONSTRUCTION

SUMMARY OF TECHNIQUES

FILE: VRDC

Date of last

WATTLES (LIVE FASCINES)

Construction Specifications:

Wattle Preparation:

- Cuttings shall be harvested and planted when the willows, or other chosen species, are dormant This period is generally from late fall to early spring.

- Choose plant materials that are adapted to the site conditions from species that root easily. A portion (up to 50%) of the bundle may be of material that does not root easily or dead material.

- The cuttings should be long (3 feet (1 m) minimum), straight branches up to 1 112 inches (4 em) in diameter. Trimmings of young suckers and some leafy branches may be included in the bundles to aid filtration. The number of stems varies with the size and kind of plant material

- Cuttings shall be tied together to form bundles, tapered at each end, 6-30 feet (2-10 m) in length, depending on site conditions or limitations in handling.

- The completed bundles should be 6-12 inches (152-.305 mm) in diameter, with the growing tips and butt ends oriented in alternating directions.

- Stagger the cuttings in the bundles so that the tips are evenly distributed throughout the length of the wattle bundle.

- Wattle bundles shall be compressed and tightly tied with rope or twine of sufficient strength and durability. Polypropolyne 'tree rope' approximately a .3/16 inch (0.5 em) diameter provides the necessary strength and durability.

- Wattle bundles shall be tied 12-15 inches (.305-381 mm) apart

- For optimum success wattles should be pre-soaked for 24 hours or installed on the same day they are harvested and prepared. The wattles should be installed within 2 days after harvest unless pre-soaked Wattles must be stored in the shade and under cover or under water.. They are live material and should be treated as such.

Installation:

- Work shall progress from the bottom to the top of the slope

- Install wattles into trenches dug into the slope on contour

- Spacing of contour trenches (wattles) is determined by soil type, potential for erosion and slope steepness.

- Perform any slope repairs, such as gully repair, slope scaling, diversion dike, gabion, or toe wall construction, prior to wattle installation.

- Beginning at the base of the slope, dig a trench on contour. The trench shall be shallow, about 1/2 the diameter of the wattle The trench width will vary from 12-18 inches (305-457 mm) depending on the slope angle.

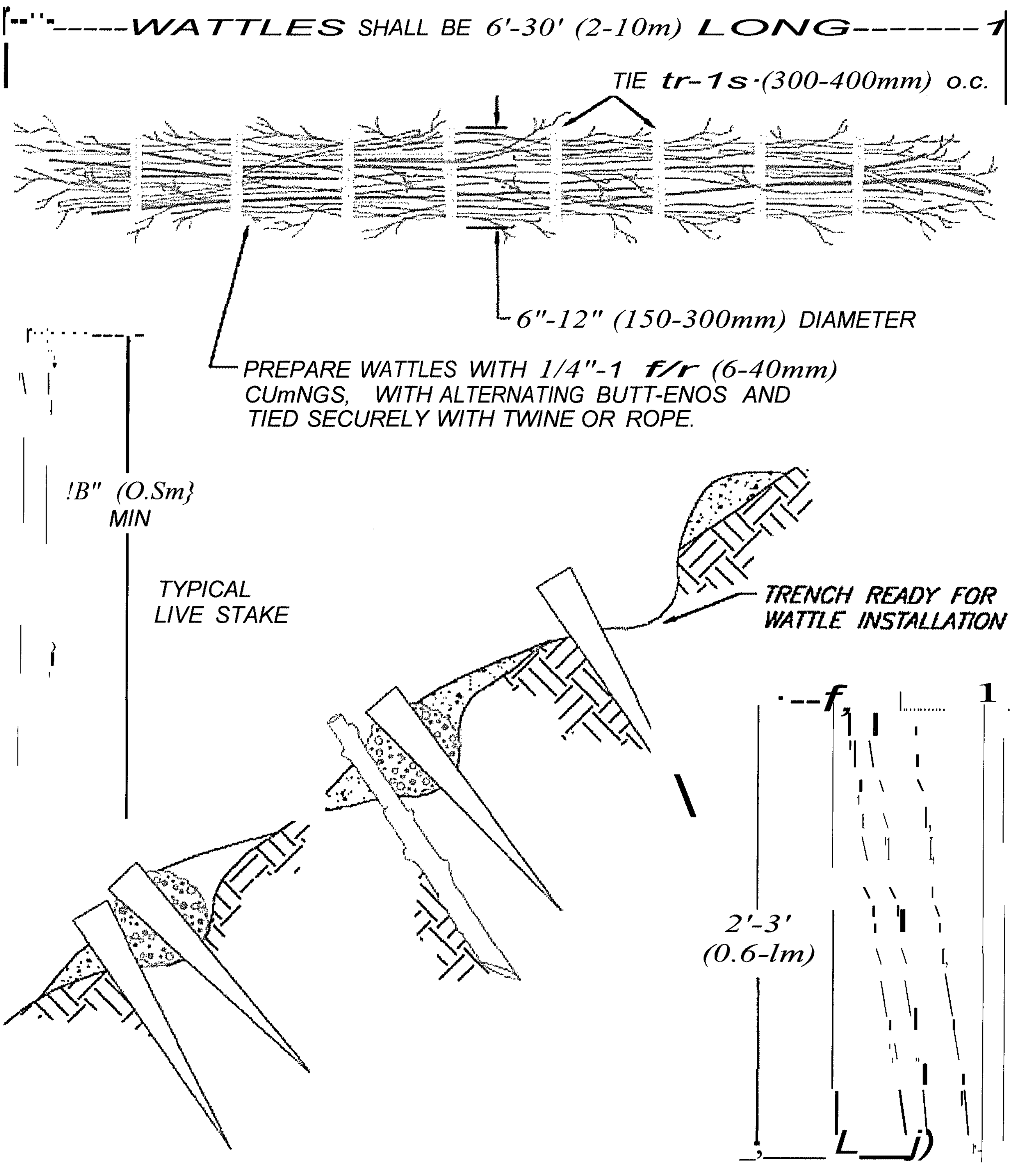
- Place the wattles immediately after trenching to reduce desiccation of the soil.

- Wattles shall be staked firmly in place with one row of construction stakes on the downhill side of the wattling, not more than 3 feet (lm) apart A second row of stakes shall be placed through the wattles, near the ties, at not more than 5 feeL (1.5 m) apart.

- Overlap the tapered ends of adjacent wattles so the overall wattle thickness of the wattle is uniform. Two stakes shall be used at each bundle overlap such that a stake may be driven between the last two ties of each wattle.
- Live stakes, if specified, are generally installed on the downslope side of the bundle Drive the live stakes below and against the bundle between the previously installed construction stakes
- Proper backfilling is essential to the successful rooting of the wattles. Backfill wattles with soil from the slope or trench above. The backfill shall be worked into the wattle interstices and compacted behind and below the bundle by walking on and working from its wattling terrace.
- Repeat the proceeding steps to the top of the slope.
- Place moist soil along the sides of the live bundle. The top of the bundle should be slightly visible when the installation is completed.
- Plant the slope as specified.
- Seed and mulch slope. Shallow slopes, generally 3:I or flatter may be seeded and mulched by hand. Steeper slopes should have seed applied hydraulically and the mulch shall be anchored with tackifier or other approved methods.

Inspection and Maintenance:

- Regular inspection and maintenance of wattle installations should be conducted, particularly during the first year
- Repairs shall be made promptly. Stakes that loosen because of saturation ofthe slope or frost action shall be re-installed.
- Rills and gullies around or under wattles shall be repaired. Perform slope scaling and brushpacking as necessary.
- Repairs to vegetative practices shall be conducted promptly.
- All temporary and permanent erosion and sediment control practices shall be maintained and repaired as needed to assure continued performance of their intended function.


WATTLES SHALL BE 6'-30' (2-10m) LONG
TIE tr-1s·(300-400mm) o.c.
6"-12" (150-300mm) DIAMETER
PREPARE WATTLES WITH 1/4"-1 f/r (6-40mm) CUmNGS, WITH ALTERNATING BUTT-ENOS AND TIED SECURELY WITH TWINE OR ROPE.
!B" (O.Sm} MIN
TYPICAL LIVE STAKE
TRENCH READY FOR WATTLE INSTALLATION
2'-3' (0.6-lm)

TYPICAL CONSTRUCTION STAKE
SAW 2X4 (100X50mm) LUMBER
ON DIAGONAL

NOT TO SCALE

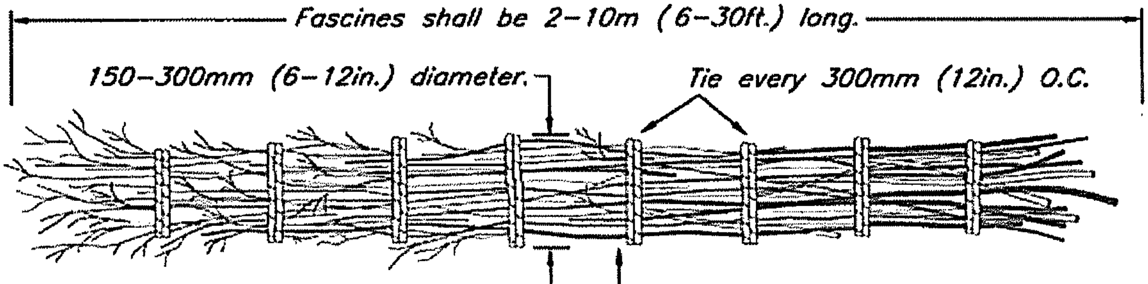
NOTES:

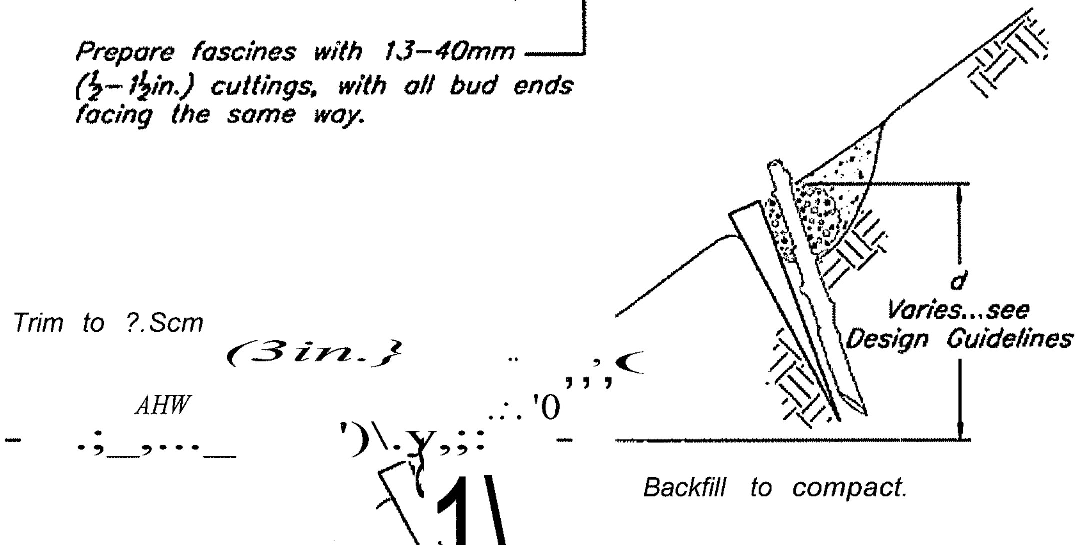
1. HARVEST AND INSTALL WATTLES DURING DORMANT SEASON.
2. INSTALL WATTLES ON SLOPE CONTOURS.
3. ALL WORK PROCEEDS FROM THE BOTTOM OF THE SLOPE TO THE TOP.
4. FILL OR PARTIALLY COVER WATTLE WITH SOIL FROM SLOPE OR TRENCH ABOVE.
5. COMPACT AND WORK SOIL INTO COMPLETED WATTLES.

WATTLE
(LIVE FASCINE)

McCULLAH

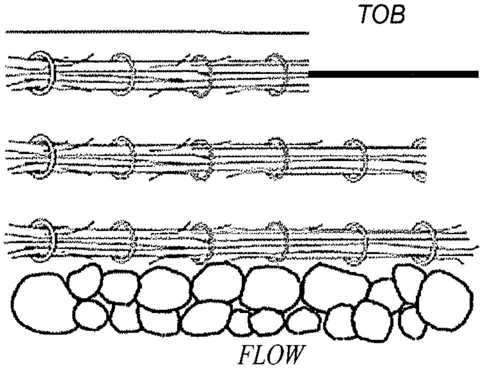
© FILE: WATTLE


Fascines shall be 2–10m (6–30ft.) long.
150–300mm (6–12in.) diameter.
Tie every 300mm (12in.) O.C.
Prepare fascines with 13–40mm (½–1½in.) cuttings, with all bud ends facing the same way.

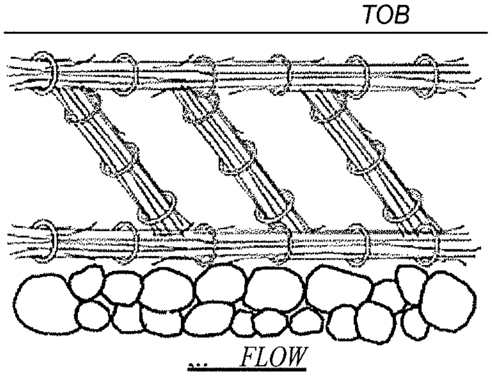


<:;RO S-SECTION

CONTOUR PLAN VIEW



ANGLED PLAN VIEW



NOT..TO. SCALE

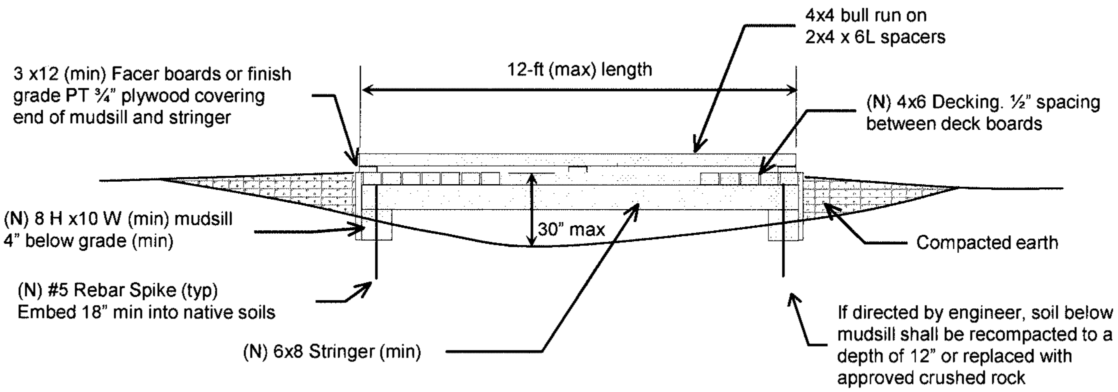
LIVE FASCINES

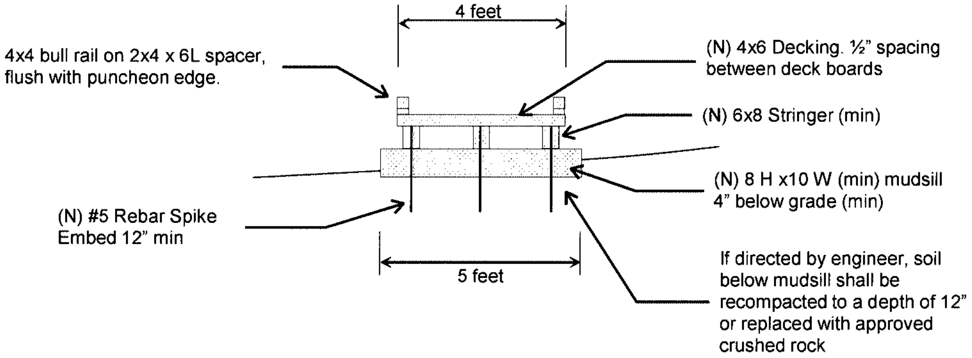
@ 2004 SALIX

Flt£: LVfASC

5E LOW PUNCHEON (BOARDWALK)

MROSD STANDARD SPECIFICATIONS (NTS)


4x4 bull run on
2x4 x 6L spacers
3 x12 (min) Facer boards or finish grade PT ¾" plywood covering end of mudsill and stringer
12-ft (max) length
(N) 4x6 Decking. ½" spacing between deck boards
(N) 8 H x10 W (min) mudsill 4" below grade (min)
30" max
Compacted earth
(N) #5 Rebar Spike (typ) Embed 18" min into native soils
If directed by engineer, soil below mudsill shall be recompacted to a depth of 12" or replaced with approved crushed rock
(N) 6x8 Stringer (min)


4 feet
4x4 bull rail on 2x4 x 6L spacer, flush with puncheon edge.
(N) 4x6 Decking. ½" spacing between deck boards
(N) 6x8 Stringer (min)
(N) 8 H x10 W (min) mudsill 4" below grade (min)
(N) #5 Rebar Spike Embed 12" min
5 feet
If directed by engineer, soil below mudsill shall be recompacted to a depth of 12" or replaced with approved crushed rock

NOTES:

- Standard puncheon width shall be 4-feet. Refer to site plan if narrower puncheon is proposed.
- All decking, beams, mudsills and wood in contact with earth or within 1 foot of earth shall be Con Heart redwood or approved plastic
- If directed by engineer, soil below mudsill shall be recompacted to a depth of 12" or replaced with approved crushed rock
- All hardware shall be galvanized
- Anchor decking with (2) 3/8" x 8" galvanized wire spikes (typ), predrill holes for spikes
- Anchor bull rail with (2) 3/8" x 10" galvanized wire spikes (typ), predrill holes for spikes
- Maintain 2% maximum slope on puncheon

TIMOTHY C. BEST, CEG
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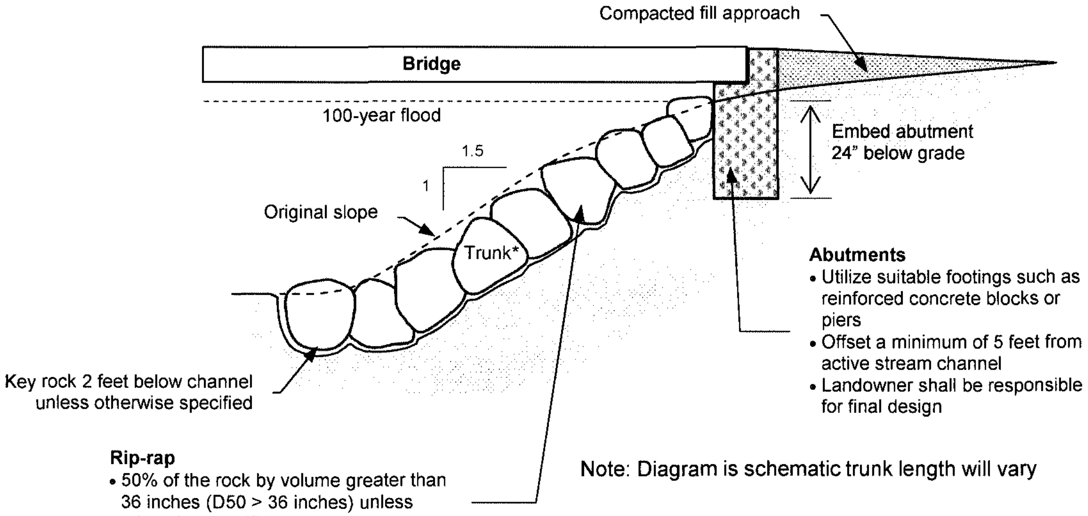
TRAIL PUNCHEON
TYPICAL SPECIFICATIONS

Standard Detail 5E

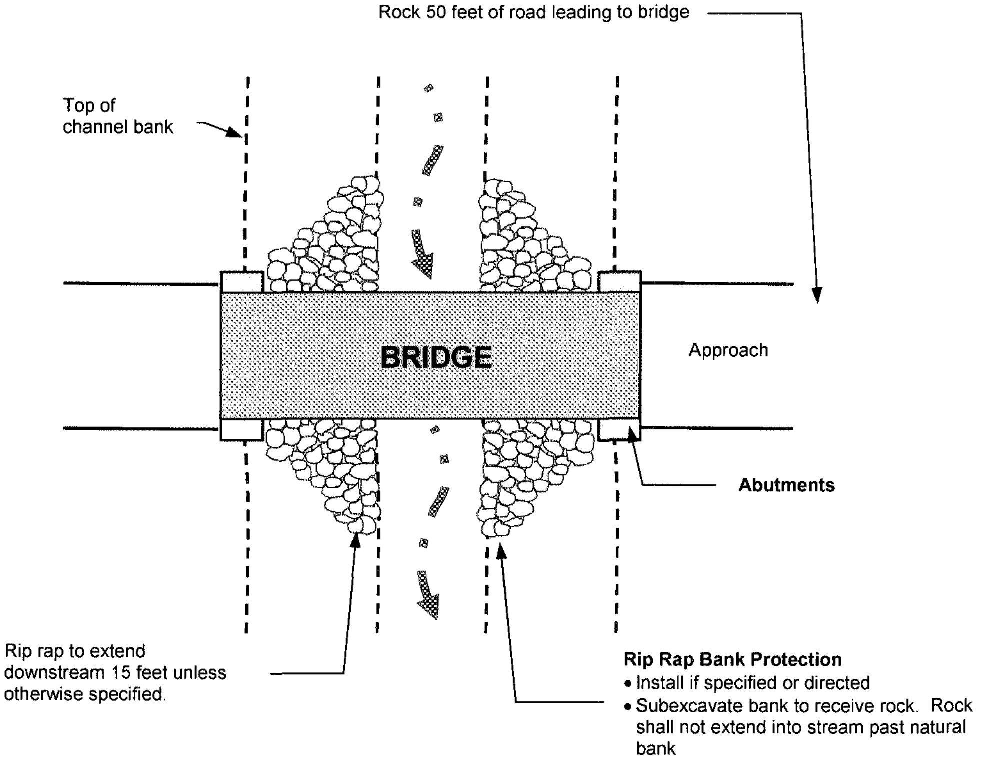
Date: May 3, 2009



Abutments
- Utilize suitable footings such as reinforced concrete blocks or piers
- Offset a minimum of 5 feet from active stream channel
- Landowner shall be responsible for final design

Rip-rap
- 50% of the rock by volume greater than 36 inches (D50 > 36 inches) unless otherwise specified
- Subexcavate bank to receive rock

Note: Diagram is schematic trunk length will vary



Rip Rap Bank Protection
- Install if specified or directed
- Subexcavate bank to receive rock. Rock shall not extend into stream past natural bank

NOTES
- Rock rip rap shall be placed as, specified in plan and as approved in DFG 1600 agreement
- Conform to requirements of the Department of Fish and Game 1600 agreement where applicable
- Bridge placement to be supervised by project engineer

5F

BRIDGE ABUTMENT ARMOR

NTS

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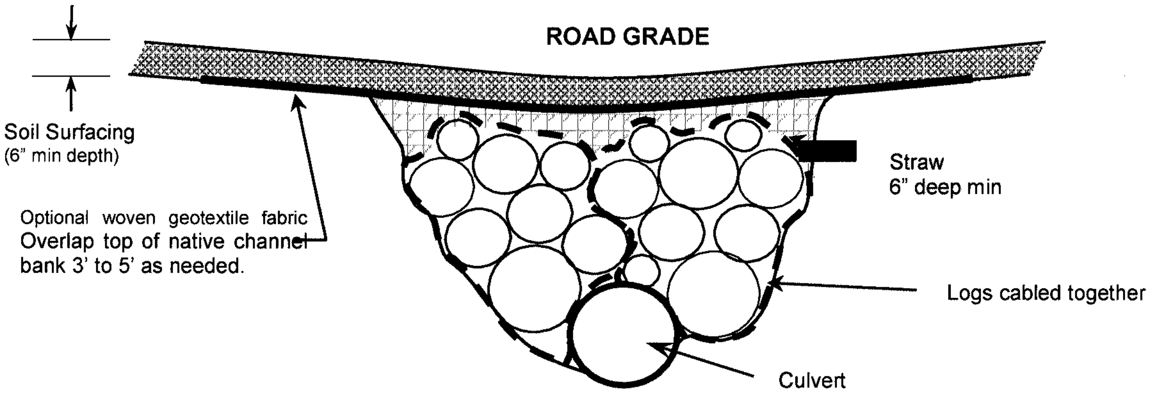
BRIDGE ABUTMENT ARMOR STANDARD PLAN

Standard Detail 5F

Date: March 1, 2009


ROAD GRADE
Soil Surfacing
(6" min depth)
Optional woven geotextile fabric
Overlap top of native channel bank 3' to 5' as needed.
Straw
6" deep min
Logs cabled together
Culvert

NOTES

1. If there is flow in channel install 12" diameter culvert at stream grade (unless otherwise specified). This may require moving rocks or wood debris in channel. Minimize the amount of disturbance to channel banks. Pipe is not required if there is no flow at time of operations
2. Groups of logs cabled together shall be carefully placed in the axis of the channel to raise the road surface to grade. Placement of the cable logs should be done in a manner to minimize the amount of ground disturbance to the channel banks. The length of fill logs or culvert shall be 20' or greater (unless otherwise specified).
3. Equipment shall avoid operations in the channel.
4. Cables may be used to choke logs in bundles in the channel if necessary
5. Place 6" minimum layer of straw over the logs and then capped by a minimum of 6" of compacted earth to create a stable running surface. Woven geotextile fabric may be required to separate fill from straw.
6. At the conclusion of operations, first remove any soil, then straw, and finally logs and the culvert.
7. Remove soil from channel and taper channel banks if specified. Mulch disturbed ground with straw or native materials.

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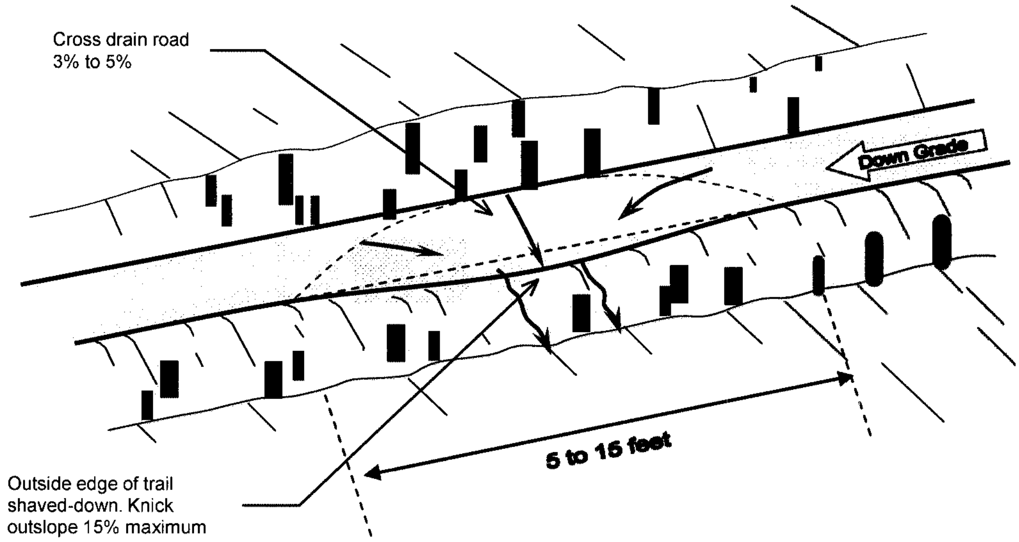
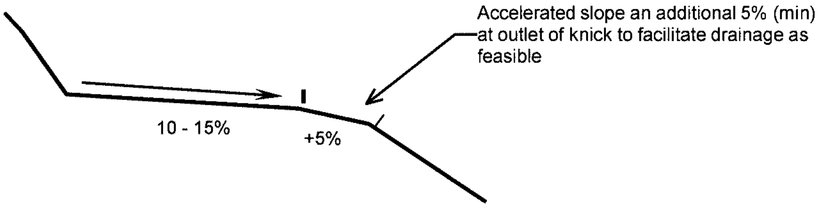
TEMPORARY "SPITTLER" STREAM CROSSING

Standard Detail 5K

Date: October 3, 2010




Accelerated slope an additional 5% (min)
at outlet of knick to facilitate drainage as
feasible
10 - 15%
+5%

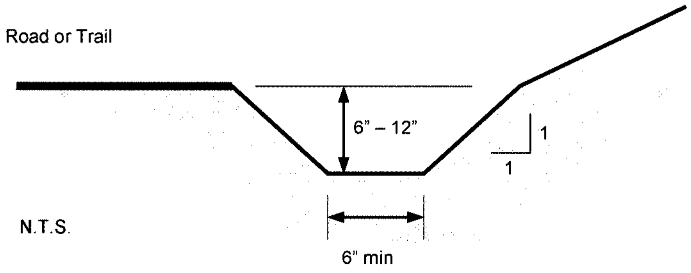
NOTES:

- A knick is a semi-circular, shaved down section of the outside edge of the trail.
- The center of the nick is outsloped 10 - 15% which draws water off of the trail.
- Dip outlets should be located to drain into areas with adequate sediment filter quality and non-erodible material such as rock, slash, brush, etc.

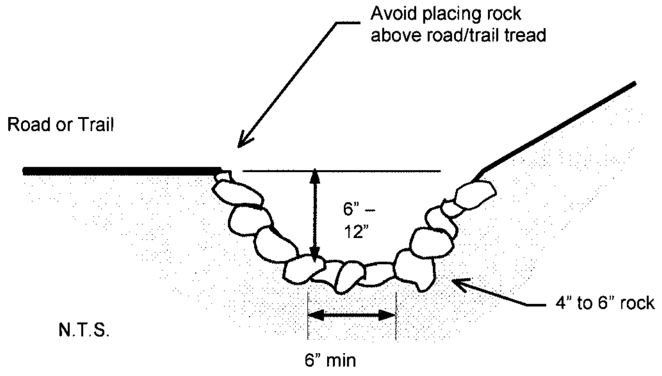
6B **KNICK (Typical)**
NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**KNICK** **TYPICAL SPECIFICATIONS**	**Standard Detail 6B** Date: November 29, 2011

INSIDE DITCH (native)



INSIDE DITCH (Rock lined)



NOTES:
- Slope ditch to drain 3% min
- Armor ditch where specified
- Drain ditch to ditch relief culvert inlet as specified.

6E **INSIDE ROAD DITCH (Typical)**
NTS

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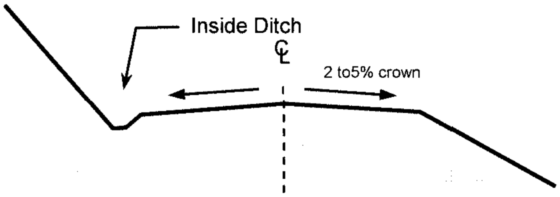
INSIDE ROAD DITCH TYPICAL SPECIFICATIONS

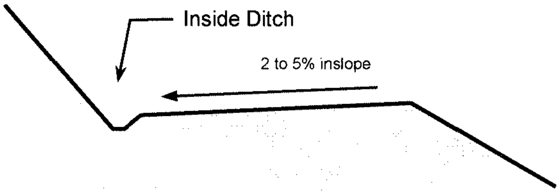
Standard Detail 6E

Date: May 3, 2009

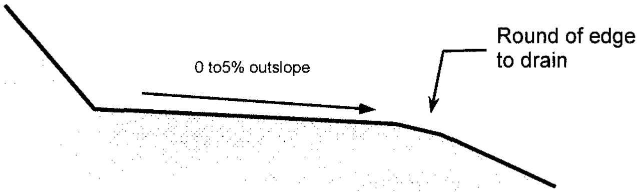
CROWNED



INSLOPED WITH DITCH



OUTSLOPED



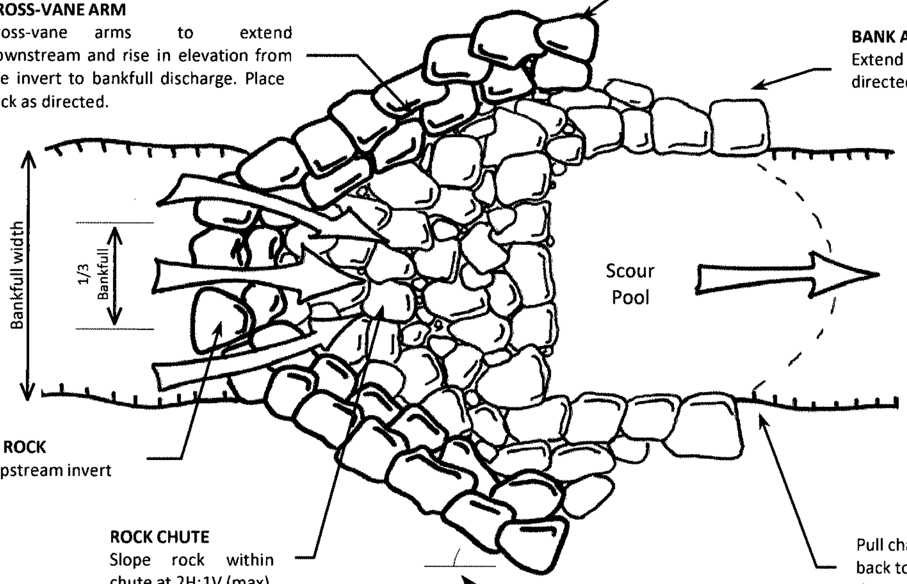
Crowned road carries surface runoff to both sides of the road. Inslope roads carry water to the inboard (uphill) side of the roadway and therefore are constructed with a ditch and ditch relief culverts to channel runoff under the roadway. Outsloped roads shed water to the outside of the road and generally do not have a ditch on the inside edge.

NOTES:
- Crowned and insloped roads shall drained to insideditch per typical 6E.
- Ditch shall have positive flow to outlet or ditch relief culvert. See 6D Ditch Relief Culvert typical design specifications
- Drainage on outsloped roads shall be complimented with Reverse Grade Dips unless otherwise specified

6F **TRAIL CROSS SLOPES (Typical)**
NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**TRAIL CROSS SLOPES TYPICAL SPECIFICATIONS**	**Standard Detail 6F** Date: June 6, 2009

CROSS-VANE
Plan View



CROSS-VANE ARM
Cross-vane arms to extend downstream and rise in elevation from the invert to bankfull discharge. Place rock as directed.

Anchor rock of each arm of the cross-vane minimum 2 rocks into bank

BANK ARMOR
Extend rock downstream as directed to protect channel bank

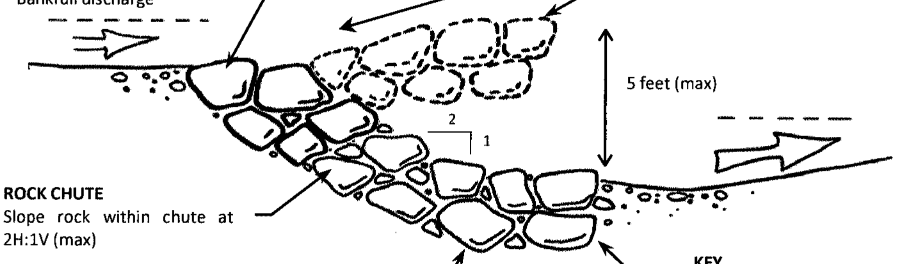
SILL ROCK
At upstream invert

ROCK CHUTE
Slope rock within chute at 2H:1V (max)

Angle cross-vane 30°

Pull channel banks back to a 1.5:1 slope if directed

CROSS-VANE
Profile



SILL ROCK
At upstream invert

CROSS-VANE ARM (projected)
Cross-vane arms to extend downstream and rise in elevation from the invert to bankfull discharge. Place rock as directed.

ROCK CHUTE
Slope rock within chute at 2H:1V (max)

ROCK
50% of the rock by volume greater than 24 inches (D50 > 24 inches) unless otherwise specified.

KEY
Key rock minimum 2 rock diameters below channel unless otherwise specified or directed

DESCRIPTION

Cross vanes are in-stream structures constructed as grade control for the streambed. The cross vane consists of a rock sill perpendicular to the stream flow located at the invert elevation of the stream. Two arms of the sill extend downstream along the banks, rising in elevation to the bankfull height as they extend downstream. The center portion of the structure is referred to as a "Rock chute"

7F CROSS-VANE INSTREAM STRUCTURE (Typical)
NTS

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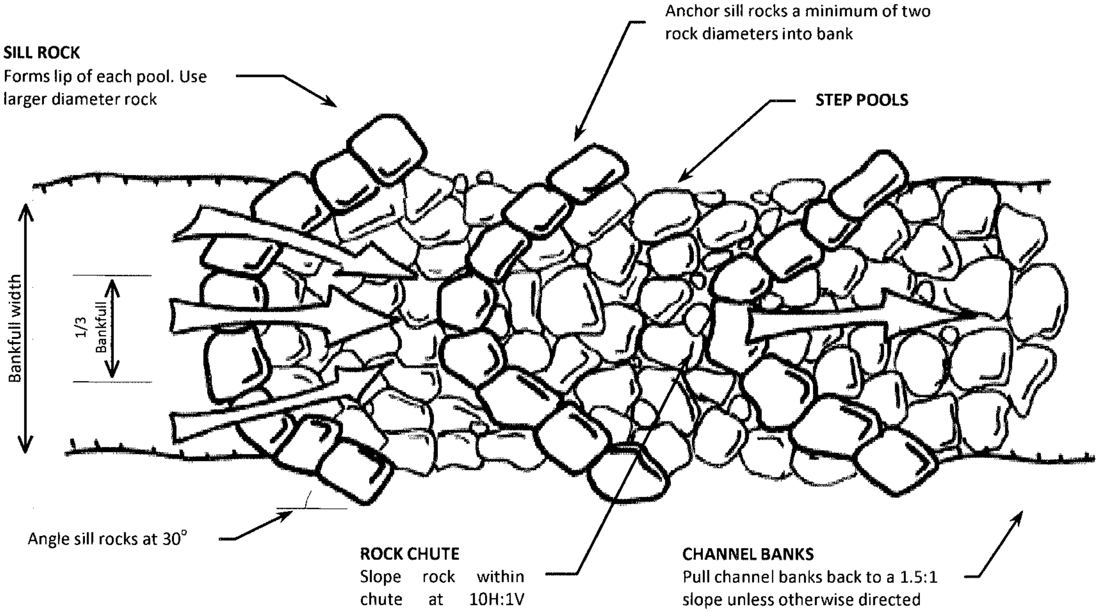
CROSS VANE STRUCTURE TYPICAL SPECIFICATIONS

Standard Detail 7F-1

Date: August 31, 2009

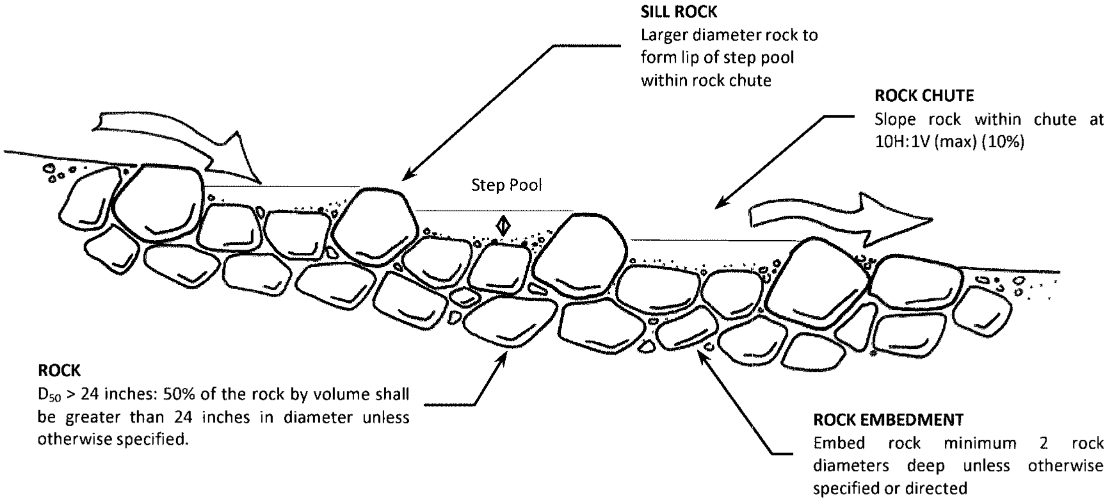
ROCK CHUTE / STEP POOL STRUCTURE

Plan View


SILL ROCK
Forms lip of each pool. Use larger diameter rock
Anchor sill rocks a minimum of two rock diameters into bank
STEP POOLS
Bankfull width
1/3 Bankfull
Angle sill rocks at 30°
ROCK CHUTE
Slope rock within chute at 10H:1V
CHANNEL BANKS
Pull channel banks back to a 1.5:1 slope unless otherwise directed

ROCK CHUTE / STEP POOL STRUCTURE

Profile


SILL ROCK
Larger diameter rock to form lip of step pool within rock chute
ROCK CHUTE
Slope rock within chute at 10H:1V (max) (10%)
Step Pool
ROCK
D50 > 24 inches: 50% of the rock by volume shall be greater than 24 inches in diameter unless otherwise specified.
ROCK EMBEDMENT
Embed rock minimum 2 rock diameters deep unless otherwise specified or directed

DESCRIPTION

Rock chute and step pool structures are in-stream structures constructed as grade control for the streambed. They are permanent structures which stabilize grades in natural or artificial channels by carrying runoff from one grade to another. "V" shaped rock banks or sills form the upstream end of each step pool. The "V" should point upstream with both limbs rising in elevation to force flow to the center of the channel.

7G ROCK CHUTE / STEP POOL STRUCTURE (Typical)

NTS

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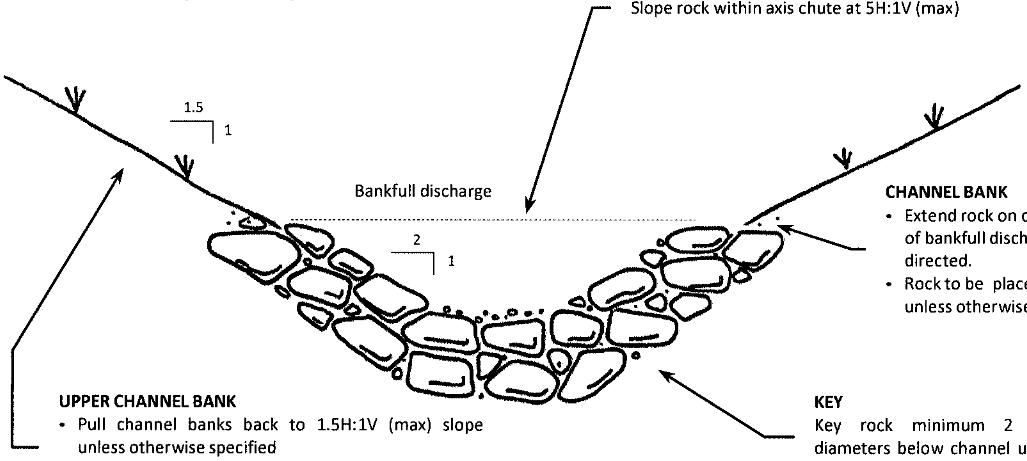
ROCK CHUTE / STEP POOL TYPICAL SPECIFICATIONS

Standard Detail 7G-1

Date: October 3, 2009

ROCK CHUTE / STEP POOL STRUCTURE

Cross-section (schematic)



ROCK CHUTE
Slope rock within axis chute at 5H:1V (max)

CHANNEL BANK
- Extend rock on channel bank to elevation of bankfull discharge as specified or directed.
- Rock to be placed at 2H:1V (max) slope unless otherwise specified or directed

UPPER CHANNEL BANK
- Pull channel banks back to 1.5H:1V (max) slope unless otherwise specified
- Apply suitable erosion control measures on channel banks as directed.

KEY
Key rock minimum 2 rock diameters below channel unless otherwise specified or directed

NOTES

Layout

- Project geotechnical consultant or designee shall clearly layout the location and limits of the rock vane prior to construction. The structure shall be installed under direction and supervision of the project geotechnical or designee

Excavation

- The channel shall be excavated at specified with maximum channel gradient of 10H:1V (10%). Excavated slopes above the rock armor shall be no steeper than 1.5H:1V (H:V) unless otherwise specified or directed. Areas to receive rock shall be subexcavated to accommodate rock placement.

Rock

- Rock shall be graded (mix of sizes) with 50% of the rock (D_{50}) greater than 24 inches minimum diameter. Ideally, the bigger the rock, the better since big rocks are less likely to shift or become dislodged.
- Rip rap shall consist of angular sound durable rock free of fracture or joint planes. The best rock is rectangular with flat surfaces on all sides. Round river rock is the worst.
- Rock shall be carefully placed to optimize strength and be a minimum of 2 layers thick and be placed so as to have no significant gap between adjoining rock. Voids shall be chinked with small boulders, cobble or rock fragments.

Rock Chute

- Rock chute shall have a maximum channel gradient of 10H:1V (10%). The chute shall consist of a flat channel bottom (as specified) with bank laid back to a 2H:1V (50%) slope. Rock shall extend up to the elevation of bankfull discharge as specified. Step pools shall be constructed into the rock chute as specified below and to the extent feasible.

Step pools

- Rock shall be placed to form a series of shallow step pools within the axis of the rock chute. Each step shall have a maximum 18 inch drop and be spaced 2 to 3 times channel width apart.
- The steps shall be constructed from of largest diameter rock to form sills at the head of each pool. The sill rocks shall be placed to in an upstream "V"-shaped configuration with the downstream limb of each rock band/sill rising in elevation to concentrate low flow into the axis of the channel. Sill rocks shall be keyed two rock diameters into the channel bank.

Inspection

- Conform to DFG 1600 agreement
- Specifications are indented only as guideline, modifications may need to be made in the field as necessary

References

CDFG (2009). California Salmonid Stream Habitat Restoration Manual: Part XII Fish Passage Design and Implementation, California Department of Fish and Game, http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp: 174.

Robinson, K. M., C. E. Rice, et al. (1998). "Design of rock chutes." ASAE 41(3): 621 - 626

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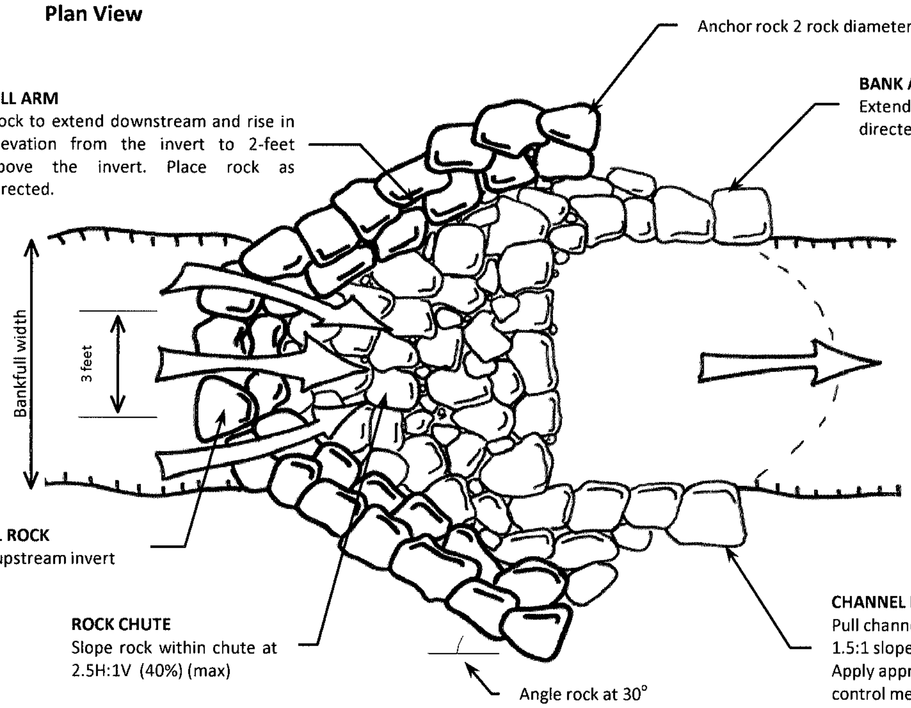
ROCK CHUTE / STEP POOL TYPICAL SPECIFICATIONS

Standard Detail 7G-2

Date: October 3, 2009

ROCK CHUTE
Plan View



Anchor rock 2 rock diameters into bank

SILL ARM
Rock to extend downstream and rise in elevation from the invert to 2-feet above the invert. Place rock as directed.

BANK ARMOR
Extend rock downstream as directed to protect channel bank

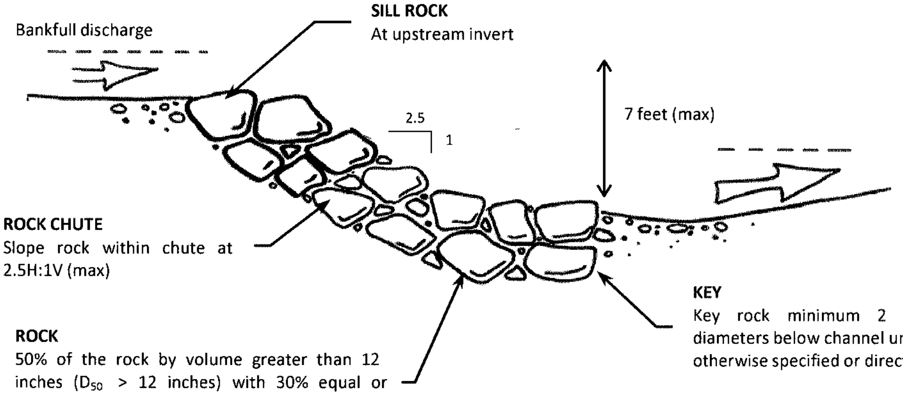
SILL ROCK
At upstream invert

ROCK CHUTE
Slope rock within chute at 2.5H:1V (40%) (max)

Angle rock at 30°

CHANNEL BANKS
Pull channel banks back to a 1.5:1 slope as directed
Apply approved erosion control measures

ROCK CHUTE
Profile



SILL ROCK
At upstream invert

ROCK CHUTE
Slope rock within chute at 2.5H:1V (max)

ROCK
50% of the rock by volume greater than 12 inches (D_{50} > 12 inches) with 30% equal or greater than 30% unless otherwise specified. Larger rock to be placed at base of structure.

KEY
Key rock minimum 2 rock diameters below channel unless otherwise specified or directed

DESCRIPTION

Rock chute structures are in-stream structures constructed as grade control for the streambed. "V" shaped rock banks or sills form the upstream end of the structure. The "V" should point upstream with both limbs rising in elevation to force flow to the center of the channel.

7H ROCK CHUTE STRUCTURE (Typical)
NTS

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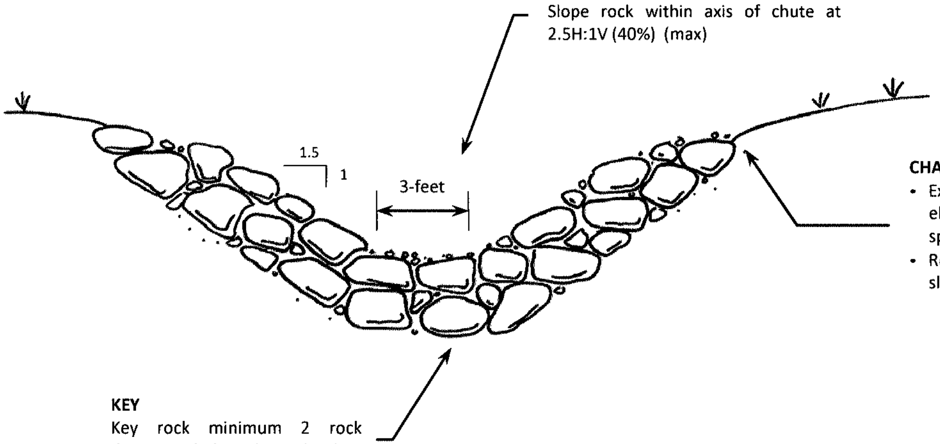
ROCK CHUTE TYPICAL SPECIFICATIONS

Standard Detail 7H-1

Date: October 24, 2009

ROCK CHUTE
Cross-section (schematic)



ROCK CHUTE
Slope rock within axis of chute at 2.5H:1V (40%) (max)

CHANNEL BANK
- Extend rock on channel bank to elevation of bankfull discharge as specified or directed.
- Rock to be placed at 2H:1V (max) slope unless otherwise specified or

KEY
Key rock minimum 2 rock diameters below channel unless otherwise specified or directed

NOTES

Layout
- Project geotechnical consultant or designee shall clearly layout the location and limits of the rock structure prior to construction. The structure shall be installed under direction and supervision of the project geotechnical consultant or designee.

Excavation
- The channel shall be excavated at specified with maximum channel gradient of 2.5H:1V (40%). Excavated slopes above the rock armor shall be no steeper than 1.5H:1V (H:V) unless otherwise specified or directed. Areas to receive rock shall be subexcavated to accommodate rock placement.

Rock
- Rock shall be graded (mix of sizes) with 50% of the rock (D_{50}) **greater** than 12 inches minimum diameter and 30% equal or greater than 18 inches. Ideally, the bigger the rock, the better since big rocks are less likely to shift or become dislodged. The contractor shall consult with the project geotechnical consultant prior to obtaining any rock.
- Rock shall consist of angular sound durable rock free of fracture or joint planes. The best rock is rectangular with flat surfaces on all sides. Round river rock is the worst.
- Rock shall be carefully placed to optimize strength and be a minimum of 2 layers thick and be placed so as to have no significant gap between adjoining rock. Voids shall be chinked with small boulders, cobble or rock fragments.

Rock Chute
- Rock chute shall have a maximum channel gradient of 2.5H:1V (40%). The chute shall consist of a flat channel bottom (as specified) with bank laid back to a 1.5H:1V (65%) slope. Rock shall extend a minimum of two vertical feet up from the channel bottom unless otherwise specified or directed.

Inspection
- Conform to DFG 1600 agreement
- Project geotechnical consultant or designee shall supervise work
- Specifications are indented only as guideline, modifications may need to be made in the field as necessary

References
CDFG (2009). California Salmonid Stream Habitat Restoration Manual: Part XII Fish Passage Design and Implementation, California Department of Fish and Game, http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp: 174.
Robinson, K. M., C. E. Rice, et al. (1998). "Design of rock chutes." ASAE **41**(3): 621 - 626

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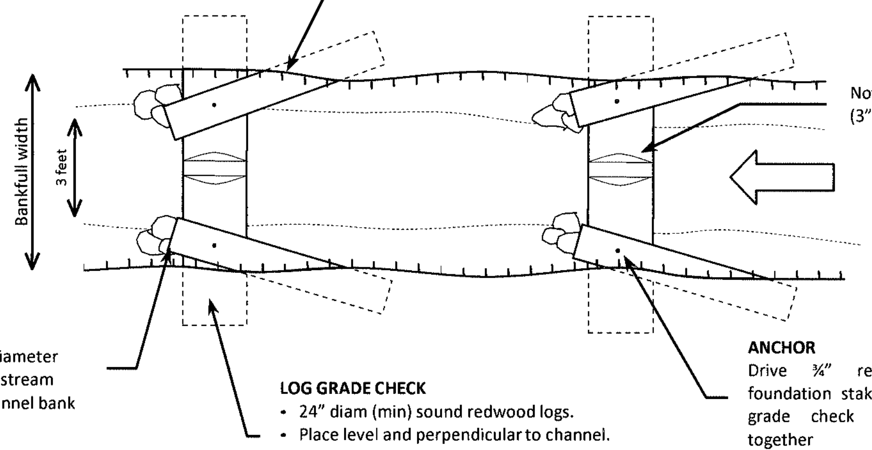
ROCK CHUTE
TYPICAL SPECIFICATIONS

Standard Detail 7H-2

Date: October 24, 2009

LOG GRADE CHECK
Plan View



CAP LOG
- 12" diameter log
- Place log at base of channel bank to protect bank from erosion
- Angle logs upstream 20°± to direct stream flow to center of channel

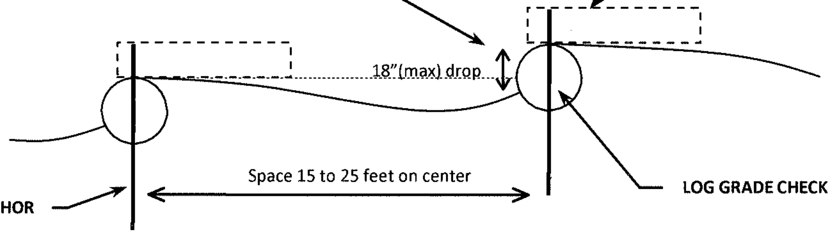
Notch log for low flow (3" deep)

ROCK
Place 12" to 18" diameter boulders on downstream end to project channel bank

LOG GRADE CHECK
- 24" diam (min) sound redwood logs.
- Place level and perpendicular to channel.
- Embed logs ½ diameter into channel bed and 3 feet (min) into channel bank

ANCHOR
Drive ¾" rebar or metal foundation stake to anchor Log grade check and cap logs together

Profile



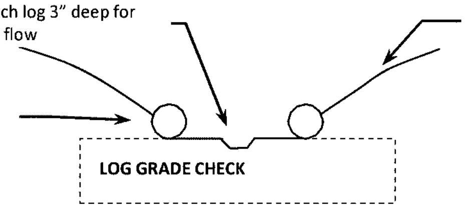
Midpoint of upstream structure shall be at same elevation as top of downstream structure

CAP LOG (projected)

ANCHOR

LOG GRADE CHECK

Cross-section



Notch log 3" deep for low flow

CAP LOGS

CHANNEL BANKS
Pull channel bank back to 1.5H:1V if directed and apply approved erosion control measures

DESCRIPTION

Log grade checks are in-stream structures constructed as grade control for the streambed. They consist of a large diameter log placed perpendicular to the stream and embedded into both channel banks. A cap log is placed on top of the log along both channel banks to protect both banks from erosion and to direct lower flows to the center of the channel.

NOTES

- Project geotechnical consultant or designee shall clearly layout the location and limits check dams prior to construction. The structure shall be installed under direction and supervision of the project geotechnical consultant or designee.
- Length and number of grade checks to be specified in plans or determined in the field
- Conform to DFG 1600 agreement
- Specifications are indented only as guideline, modifications may need to be made in the field as necessary

7I LOG CHECK DAM STRUCTURE (Typical)
NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**LOG GRADE CHECK TYPICAL SPECIFICATIONS**	Standard Detail 7I Date: October 24, 2009

EROSION CONTROL

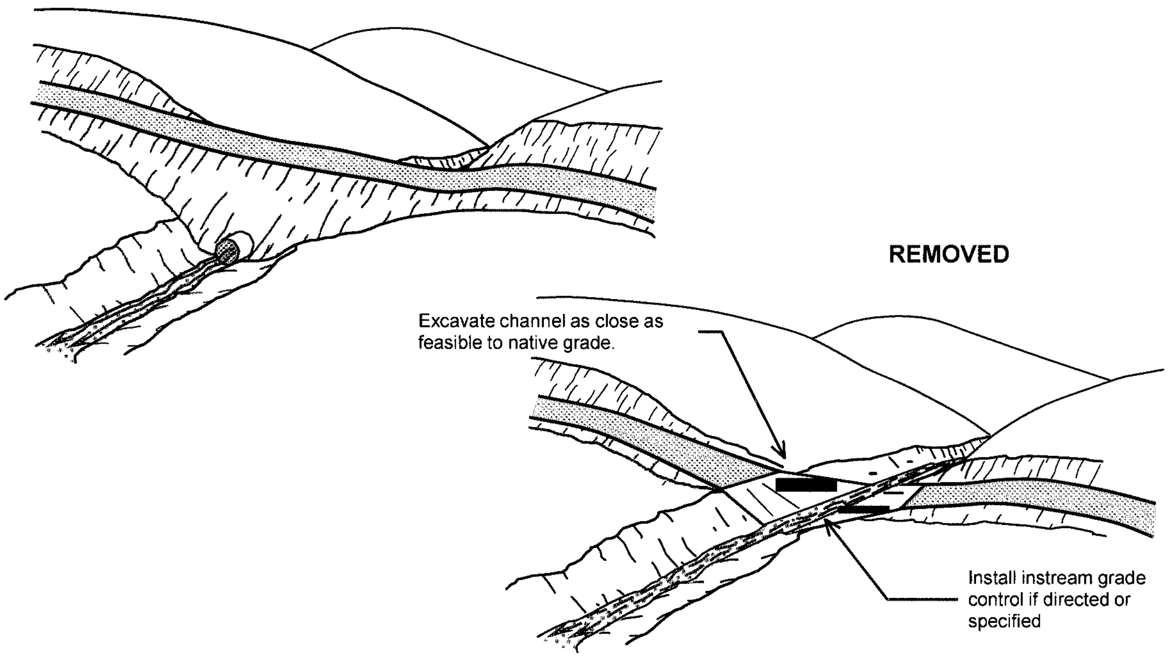
- During project construction, the Contractor shall be responsible for implementing appropriate and necessary erosion control measures to minimize storm water runoff from the construction site, pursuant to applicable regulations and permits. The following strategies to ensure that storm water pollution is prevented shall be employed:
  - Minimize erosion and sedimentation during construction.
  - Eliminate pollution of storm runoff by chemicals and materials used in the construction process

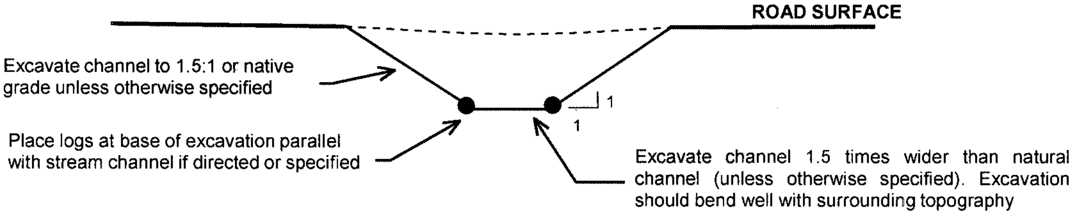
- Exposed mineral soils greater than 50 square feet (sf) with less than 80% ground coverage of natural vegetation shall be seeded and mulched in order to reduce the potential for short term sheet and rill erosion.
  - Seeding
    - Broadcast approved seed mix
  - Mulch:
  - Use native much were feasible
    - Where native much is unavailable and/or as directed by the geotechnical consultant or designee, mulch using 1 1/2" to 2" of approved certified weed-free straw mulch. Exposed slopes steeper than 1:1 may be covered with "Bon Terra, C2" or similar approved fabric placed in accordance with the manufacturer's recommendations and as directed by geotechnical consultant or designee.
    - If available and directed by project geotechnical consultant or designee, disturbed ground may be slash mulched using six-inch minus woody debris with 90% coverage. Slash should be packed using a dozer or the bucket of the excavator.
    - Apply mulch after seed

- Install a straw rolls across bare slopes and/or at base of disturbed areas if directed by CEG, RPF and/or designees or specifically called out in recommendations.

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**EROSION CONTROL NOTES**	**Standard Detail 8A** Date: May 3, 2009

EXISTING CROSSING


REMOVED
Excavate channel as close as feasible to native grade.
Install instream grade control if directed or specified


ROAD SURFACE
Excavate channel to 1.5:1 or native grade unless otherwise specified
1
1
Place logs at base of excavation parallel with stream channel if directed or specified
Excavate channel 1.5 times wider than natural channel (unless otherwise specified). Excavation should bend well with surrounding topography

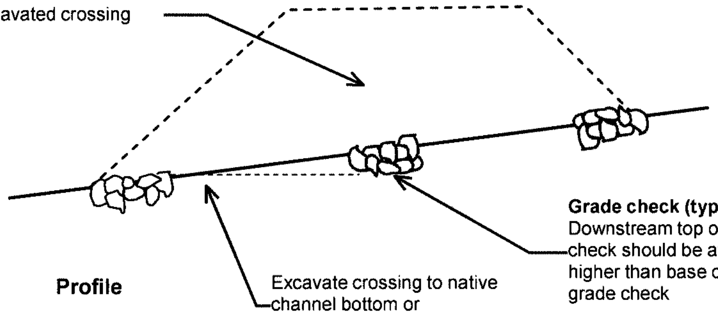
NOTES

- Excavate a channel that is 1.5 times wider than the natural channel (unless otherwise specified).
  - Excavated channel shall be as close as feasible to the grade and orientation of the natural channel
  - Channel banks shall be excavated to a 1.5:1 slope or native grade (whichever is steepest) unless otherwise specified in the plan or directed
  - Excavation should blend well with surrounding natural topography
  - Spoils shall be placed and compacted along a stable portion of the inboard edge of the road, unless otherwise specified. Fill shall be placed in a manner to prevent future erosion. Fill shall be compacted to 85% relative compaction unless otherwise specified or directed.
- Install instream grade control if specified in the plan or directed. Grade control shall consist of large wood or rock and is intended to prevent stream down cutting. See general specifications
- Place logs at base of excavated channel if directed. Logs to be placed parallel with stream with upstream log overlapping downstream log. Logs to be embedded into channel bank to minimize stream bank erosion. Log diameter to be determined by project geotechnical consultant or designee.
- Mulch disturbed ground
  - If available and directed by project geotechnical consultant, the excavated channel banks and spoil sites may be slash mulched using 6-inch minus woody debris with 90% coverage. Slash should be packed using a dozer or the bucket of the excavator.
- Install a straw roll at base of disturbed areas as directed by geotechnical consultant and/or District representative
- Conform to requirements Department of Fish and Game 1600 agreements where applicable
- Specifications are intended only as guideline, modifications may be made in the field by geotechnical consultant or designee

9B **STREAM CROSSING REMOVAL**
NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**CROSSING REMOVAL** **TYPICAL SPECIFICATIONS**	**Standard Detail 9B** Date: May 3, 2009

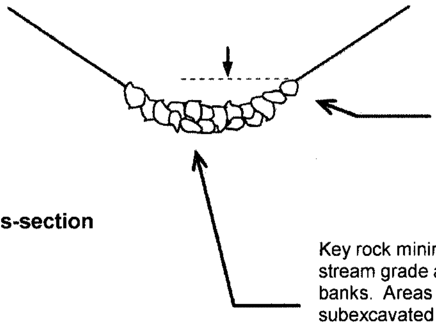
PRELIMINARY



Grade check (typ.): Downstream top of grade check should be at or slightly higher than base of upstream grade check

Profile

Excavate crossing to native channel bottom or designated depth



Extend rock partway up of the channel banks as specified in plans or directed to formi a well defined spillway.

Cross-section

Key rock minimum 12 inches below stream grade and 12 inches into channel banks. Areas to receive rock shall be subexcavated so that the top of the rock is roughly flush with the excavated channel bottom.

NOTES

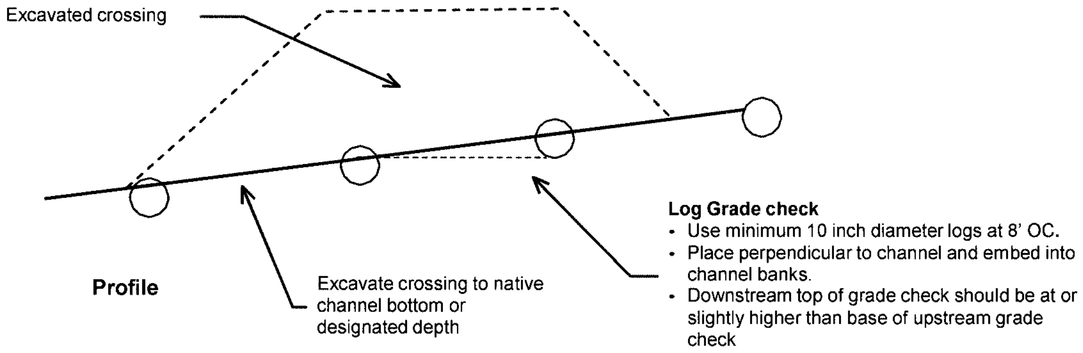
- Grade check shall consist of large wood or rock rip rap as specified in plans or directed by project geotechnical consultant.
- Rock to be keyed minimum 12 inches below stream grade and 12 inches into channel banks.
- Areas to receive rock shall be subexcavated so that the top of the rock is roughly flush with the excavated channel bottom
- Rock shall extend partway up of the channel banks forming a well defined spillway to confine stream flow.
- Downstream top of grade check should be at or slightly higher than base of upstream grade check
- Length and number of grade checks to be specified in plans or determined in the field
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee

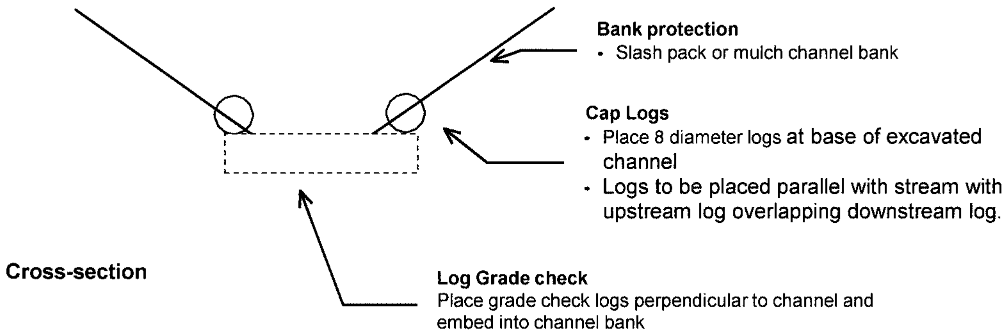
ROCK GRADE CHECK PRELIMINARY

NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**ROCK GRADE CHECK TYPICAL SPECIFICATIONS**	**Standard Detail 9C** Date: May 3, 2009

PRELIMINARY


Excavated crossing
Log Grade check
• Use minimum 10 inch diameter logs at 8' OC.
• Place perpendicular to channel and embed into channel banks.
• Downstream top of grade check should be at or slightly higher than base of upstream grade check
Profile
Excavate crossing to native channel bottom or designated depth


Bank protection
• Slash pack or mulch channel bank
Cap Logs
• Place 8 diameter logs at base of excavated channel
• Logs to be placed parallel with stream with upstream log overlapping downstream log.
Cross-section
Log Grade check
Place grade check logs perpendicular to channel and embed into channel bank

NOTES
- Grade check shall consist of large wood as specified in plans or as directed by project geotechnical consultant.
- Downstream top of grade check should be at or slightly higher than base of upstream grade check
- Length and number of grade checks to be specified in plans or determined in the field
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee

9D **WOOD GRADE CHECK PRELIMINARY**
NTS

TIMOTHY C. BEST, CEG ENGINEERING GEOLOGY AND HYDROLOGY 1002 Columbia Street, Santa Cruz, CA 95060 (831) 425-5832 (831) 425 5830 fax.	**WOOD GRADE CHECK TYPICAL SPECIFICATIONS**	**Standard Detail 9D** Date: May 3, 2009

Appendix E

Construction Noise Calculations

Construction Source Noise Prediction Model

ASCENT ENVIRONMENTAL

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Threshold	1,068	55.0
Residence 1	1000	54.0
Residence 2	0	#NUM!

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	85	1
Dump Truck	84	1
Front End Loader	80	1

Ground Type	SOFT
Source Height	8
Receiver Height	5
Ground Factor[2]	0.63

Predicted Noise Level [3]	L_{eq} dBA at 50 feet[3]
Dozer	85.0
Dump Truck	84.0
Front End Loader	80.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
88.2

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Figure 6-5 from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 6-23).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006 (pg 12-3).

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2006: pg 6-23); and

D = Distance from source to receiver.

MITIGATION MONITORING PROGRAM
FOR
HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

MITIGATION MONITORING PROGRAM CONTENTS

This mitigation monitoring program (MMP) includes a brief discussion of the legal basis and purpose of the program, a key to understanding the monitoring matrix, discussion and direction regarding noncompliance complaints, and the mitigation monitoring matrix itself.

LEGAL BASIS AND PURPOSE OF THE MITIGATION MONITORING PROGRAM

Public Resources Code (PRC) 21081.6 requires public agencies to adopt mitigation monitoring or reporting programs whenever certifying an environmental impact report or mitigated negative declaration. This requirement facilitates implementation of all mitigation measures adopted through the California Environmental Quality Act (CEQA) process.

MONITORING MATRIX

The following page provides a table identifying the mitigations incorporated into the Hendrys Creek Long-Term Management Plan (the project). These mitigations are reproduced from the Initial Study/Mitigated Negative Declaration (IS/MND) for the project. The columns within the tables have the following meanings:

Impact:	This column refers to the Initial Study section where the mitigation is discussed.
Mitigation Measure(s):	This column lists the specific mitigation identified within the Mitigated Negative Declaration.
Timing:	This column identifies at what point in time, review process, or phase the mitigation will be completed. The mitigations are organized by order in which they appear in the Mitigated Negative Declaration
Monitoring Responsibility:	This column references the District department that will ensure implementation of the mitigation.
Verification:	This column will be initialed and dated by the individual designated to confirm implementation.

NONCOMPLIANCE COMPLAINTS

Any person or agency may file a complaint asserting noncompliance with the mitigation measures associated with the project. The complaint shall be directed to the District's General Manager in written form, providing specific information on the asserted violation. The General Manager shall cause an investigation and determine the validity of the complaint; if noncompliance with a mitigation measure has occurred, the General Manager shall cause appropriate actions to remedy any violation. The complaint shall receive written confirmation indicating the results of the investigation or the final action corresponding to the particular noncompliance issue.

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
Mitigation in Section IV Biological Resources	**Mitigation Measure 3.4-1** *MROSD shall implement the following measures to avoid and minimize impacts to California red-legged frog and Foothill yellow-legged frog.* ▪ *Worker Education Seminar. Prior to conducting any action that may negatively affect listed species, all staff, contractors and persons associated with the project shall attended a worker-education seminar delivered by a qualified MROSD biologist or other qualified biologist. The seminar shall include written information regarding California red-legged frog and Foothill yellow-legged frog identification, natural history and habitat, legal status, and provisions and penalties under the Endangered Species Act, as applicable. Names and phone numbers of the biological monitors and USFWS and CDFW contacts should be included in the written information. MROSD shall maintain a signature sheet to document compliance, which will be made available upon request.* ▪ *Biological Construction Monitoring. A qualified biologist shall conduct a pre-activity survey for California red-legged frog and Foothill yellow-legged frog prior to implementing actions that include ground disturbance, vegetation removal, or other activities associated with culvert or crossing removal that could otherwise harm California red-legged frog or Foothill yellow-legged frog. A qualified biologist shall inspect the work area while vegetation and debris is removed during the initial phase of construction. If no California red-legged frogs or Foothill yellow-legged frogs are observed during either the pre-activity survey or during removal of vegetation and debris, then work may proceed without a qualified biologist present. If California red-legged frogs or Foothill yellow-legged frog are observed at any time before or*	Prior to and during construction activities (including maintenance-related construction).	MROSD Operations Dept. (Resource Specialist) with Planning PM in consultation with USFWS and CDFW, as necessary.	

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
	during construction within the work area by anyone involved in the project, work shall cease and USFWS and/or CDFW shall be contacted for guidance.			
Mitigation in Section IV Biological Resources	**Mitigation Measure 3.4-2** *MROSD shall implement the following measures to avoid and minimize impacts special-status mammals.* ▪ *Special-Status Bats. Within 30-days prior to initiating ground disturbance or vegetation removal, a qualified bat biologist shall inspect the area of disturbance and areas adjacent (within 50 feet) for bat roosts (most likely mature trees and snags and possibly (although unlikely) under the small bridges spanning Hendrys Creek. Surveys will consist of a daytime pedestrian survey looking for evidence of bat use (e.g., guano) and/or an evening emergence survey to note the presence or absence of bats. The type of survey will depend on the condition of the habitat. If no bat roosts are found (excluding the bat houses), then no further study is required. If evidence of bat use is observed, the number and species of bats using the roost will be determined. Bat detectors may be used to supplement survey efforts, but are not required. If roosts of pallid or western red, bats are determined to be present within the survey area, direct disturbance to the roost, such as tree removal or bridge replacement that are occupied by bats, shall be avoided during the breeding season (April 1 through August 31). The bat roosts will not be disturbed.* ▪ *San Francisco Dusky-Footed Woodrat. Within 30 days prior to project construction, a qualified biologist shall inspect the*	Prior to construction activities.	MROSD Operations Dept. (Resource Specialist) with Planning PM in consultation with CDFW, as necessary.	

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
	disturbance area and adjacent areas within 50 feet for woodrat houses. If none are found, then no additional measures are necessary. If a woodrat house is identified within 50 feet of the work area, an exclusion zone shall be erected around the existing woodrat houses using flagging or a temporary fence that does not inhibit the natural movements of wildlife (such as steel T-posts and a single strand of yellow rope or similar materials). The work area shall be relocated as necessary to avoid impacting woodrat houses, even if avoidance is by only a few feet. If woodrat houses cannot be avoided by the trail, CDFW shall be contacted for approval to relocate individuals by live-trapping and building a nearby artificial house as a release site. Approval to relocate shall be acquired from CDFW.			
Mitigation in Section IV Biological Resources	**Mitigation Measure 3.4-3** *MROSD shall limit vegetation removal to the minimum necessary to conduct the project. For all construction activities that could result in potential noise and other land disturbances that could affect nesting birds (e.g., tree removal, mowing, mastication, brush removal), the construction area shall be surveyed to evaluate the potential for nesting birds. Tree removal will be limited, whenever feasible, based on the presence or absence of nesting birds. For all other construction activities, if birds exhibiting nesting behavior are found within the treatment sites during the bird nesting season (March 15 – August 30 for smaller bird species such as passerines and February 15 - August 30 for raptors) impacts on nesting birds will be avoided by the establishment of appropriate buffers around active nests. The distance of the protective buffers surrounding each active nest site are: 500 feet for large raptors such as buteos, 250 feet for small raptors such as accipiters, and 250 feet for passerines. The size of the buffer may be adjusted by an MROSD biologist in consultation*	Before, during, and after construction.	MROSD Operations Dept. (Resource Specialist) with Planning PM in consultation with USFWS and CDFW, as necessary.	

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
	with CDFW and USFWS depending on site specific conditions. Monitoring of the nest by an MROSD biologist during and after construction activities will be required if the activity has potential to adversely affect the nest. Construction may resume in these areas after an MROSD biologist or designated biological monitor confirms that the young have fully fledged, are no longer being fed by the parents, and have left the nest site. For construction activities that clearly would not have adverse impacts to nesting birds (e.g. non-powered hand tool work), no survey for nesting birds would be required.			
Mitigation in Section IV Biological Resources	**Mitigation Measure 3.4-4** *MROSD shall implement the following measures to avoid and minimize impacts to special-status plants.* ▪ *MROSD shall utilize qualified staff or a contractor to conduct protocol-level preconstruction special-status plant surveys for all potentially occurring species within the project footprint that has not previously been surveyed. Prior to ground-disturbance or vegetation management in potentially suitable habitat, surveys shall be conducted during the appropriate blooming period when they are most readily identifiable in accordance with Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (DFG 2009). If no special-status plants are found during focused surveys, the findings shall be documented in a letter report, and no further mitigation shall be required.* ▪ *If special-status plant populations are present in the project footprint, MROSD shall determine if the population can be avoided by adjusting the project design.*	Prior to construction.	MROSD Operations Dept. (Resource Specialist) with Planning PM in consultation with CDFW and/or USFWS, as necessary.	

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
	▪ *If the impact to special-status plants cannot be avoided, MROSD shall consult with CDFW or USFWS, as appropriate depending on species' status, to determine the appropriate measures to ensure no net loss of occupied habitat or individuals. These measures may include preserving and enhancing existing populations, creation of off-site populations on project mitigation sites through seed collection or transplantation, and/or restoring or creating suitable habitat in sufficient quantities to achieve the no-net-loss standard.*			
Mitigation in Section IV Biological Resources	**Mitigation Measure 3.4-5** *MROSD operates under a special agreement known as "Waste Discharge Requirements and Section 401 Water Quality Certifications for Routine Maintenance Activities (Order No. R2-2010-0083)" with the California Regional Water Quality Control Board. In addition, MROSD holds a similarly-structured agreement known as the Final Lake or Streambed Alteration Agreement (Notification No. 1600-2012-0444-R3) District-wide Routine Maintenance Agreement with the California Department of Fish and Wildlife. A portion of the work proposed under this project will apply under these two permitting authorities and agreements; the remainder of the project work will comply with the following measures to compensate for the temporary loss of wetlands and other waters of the United States:* ▪ *MROSD will submit a wetland delineation report to USACE and request a preliminary jurisdictional determination. Based on the jurisdictional determination, MROSD will determine the exact acreage of waters of the U.S. and waters of the state that would be filled as a result of project implementation.*	Prior to construction activities near or within a wetland or other waters of the U.S.	MROSD Operations Dept. (Resource Specialist) with Planning PM in consultation with USACE.	

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
	▪ *MROSD will replace on a "no net loss" basis (minimum 1:1 ratio) (in accordance with USACE and/or RWQCB) the acreage and function of all wetlands and other waters that would be removed, lost, or degraded as a result of project implementation. Wetland habitat will be restored on-site as determined during the Section 401 and Section 404 permitting processes.* ▪ *MROSD will coordinate with the USACE to obtain either a Nationwide Permit or a USACE Section 404 Permit and RWQCB Section 401 certification before any groundbreaking activity within 50 feet of any wetland or water of the United States. MROSD will implement all permit conditions.*			
Mitigation in Section V Cultural Resources	**Mitigation Measure 3.5-1** *In the event that any prehistoric or historic-era subsurface archaeological features or deposits are discovered during construction, all ground-disturbing activity within 100 feet of the find shall be halted and a qualified professional archaeologist shall be retained to assess the significance of the find. If the find is determined to be significant by the qualified archaeologist (i.e., because it is determined to constitute either an historical resource or a unique archaeological resource), the archaeologist shall develop appropriate procedures to protect the integrity of the resource and ensure that no additional resources are affected. Procedures could include but would not necessarily be limited to preservation in place, archival research, subsurface testing, or contiguous block unit excavation and data recovery. If the archaeologist determines that some or all of the affected property qualifies as a Native American Cultural Place, including a Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine (Public Resources Code Section 5097.9) or a Native American historic, cultural, or sacred site,*	During construction.	MROSD Operations Dept. (Resource Specialist) with Planning PM	

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
	that is listed or may be eligible for listing in the California Register of Historical Resources pursuant to Public Resources Code Section 5024.1, the archaeologist shall recommend, and MROSD shall implement, potentially feasible procedures that would preserve the integrity of the site or minimize impacts on it.			
Mitigation in Section V Cultural Resources	**Mitigation Measure 3.5-2** In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, the foreman shall immediately halt potentially damaging excavation in the area of the burial and notify the County Coroner and a professional archaeologist to determine the nature of the remains. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). Following the coroner's findings, the archaeologist, and the NAHC-designated Most Likely Descendent shall determine the ultimate treatment and disposition of the remains and take appropriate steps to ensure that additional human interments are not disturbed. The responsibilities for acting upon notification of a discovery of Native American human remains are identified in California Public Resources Code Section 5097.94.	During construction.	MROSD Operations Dept. (Resource Specialist) with Planning PM	
Mitigation in Section VIII Hazards and Hazardous Materials	**Mitigation Measure 3.8-1** *To further reduce the potential for wildland fire ignition, the following additional mitigation measure is required:*	During construction and maintenance activities	MROSD Administration and Operations Depts.	

HENDRYS CREEK LONG-TERM MANAGEMENT PLAN

Impact	Mitigation Measure(s)	Timing	Monitoring Responsibility – District Department	Verification (Date & Initials)
	▪ *To reduce fire ignition risk, MROSD currently requires the following measures for all maintenance and construction activities:* ▪ All equipment to be used during construction and maintenance activities must have an approved spark arrestor. ▪ Grass and fuels around construction sites where construction vehicles are allowed to be parked will be cut or reduced. ▪ Mechanical construction equipment that can cause an ignition will not be used when the National Weather Service issues a Red Flag Warning for the San Francisco Bay Area. ▪ Hired contractors shall be required to: ■ Provide water and/or fire extinguisher to suppress potential fires caused by the work performed. ■ Remind workers that smoking is prohibited at the work site and on any MROSD land per contract conditions and MROSD Ordinance. ■ Maintain working ABC fire extinguishers on all vehicles in the work area.			